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No. 2.—ENZOOTIC ABORTION IN EWES*

A Preliminary Note

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The following paper is to be regarded as only a preliminary note upon a form of enzootic abortion in ewes which exhibits a number of characters suggesting that its pathogenesis may not represent an infective process. The object of the note is to draw attention to the existence of this disease, which has not yet received notice in veterinary literature, and to indicate the nature and the results of the investigations which, up to the present time, have been applied in its elucidation.

As is well known, the ewe is the subject of certain infective conditions causing abortion of an epizootic character. In 1913, the Departmental Committee appointed by the then Board of Agriculture and Fisheries[1] reported the results of the investigations of M'Fadyean and Stockman, who found that a vibrio, later named *Vibrio foetus*, was responsible for outbreaks of abortion in the ewe. In 1925, Bosworth and Glover[2] showed that an organism of the Salmonella group, *Bacterium abortus ovis* (*Salmonella abortivo ovinus*), was capable of producing a specific form of abortion in sheep. It may be accepted that these two specific infections represent the great majority of outbreaks of epizootic abortion in sheep in this country.

Although as long ago as 1889 the Committee appointed by the Highland and Agricultural Society of Scotland[3] succeeded experimentally in producing abortion in ewes by infecting them through the medium of vaginal discharge obtained from aborted cows, it is doubtful whether there occur in this country natural outbreaks of abortion in ewes due to *Brucella abortus* (Bang).

In 1930, a number of cases of a form of enzootic abortion were brought to our notice. Flockmasters are reluctant to disclose the fact that their flocks are affected, but, as the result of an appeal published in the agricultural press, followed by a questionnaire, it was ascertained that the incidence of the disease was widespread in Scotland, and that it represented a very important economic problem; a considerable volume of information was also obtained relating to its conditions of occurrence in the following counties: Argyll, Perth, Midlothian, Fife, Stirling, Dumfries, Kirkcudbright, Ayr, Wigtown, Roxburgh, Selkirk and Berwick.

The disease has been experienced as an annual occurrence on certain farms over long periods of time. On one farm its existence has been recorded for at least 50 years. Definite "abortion areas" are recognised, and in these a number of adjoining farms are found to be affected. While the disease is largely confined to definite locations, there is evidence that it is extending in its geographical distribution, and farms upon which abortion had not been known previously have become affected during the last few years. In "abortion areas," the annual percentage abortion rate shows considerable variation: whereas upon occasion a 30 per cent. rate has been experienced, on many farms no more than 5 per cent. of the ewes abort, while in numerous other instances, it is found that the flockmaster fully expects to lose each year 10 per cent. or even 20 per cent. of his lamb crop, in addition to the normal losses resulting from sterility—in hill flocks, an average of about 3 or 4 per cent. of the ewes prove sterile (yeld ewes).

The disease is almost wholly confined to hill grazings and occurs at all elevations, from a few hundred feet to over 2,000 feet, and neither geological formation nor particular types of pasture appears to bear any relation to its occurrence.

It is a common belief that the character of the weather is to be regarded as an important predisposing cause. For instance, it is considered that a long cold period in early spring, resulting in backward vegetation, is an important factor in its causation; but the disease occurs under widely varying conditions of weather and apparently little significance can be attached to these.

The act of abortion is not, as a rule, attended by untoward effects on the ewe. In many instances, the abortion occurs about the third month of pregnancy and it is only when the ewes are "udder-locked," shortly before the lambing season is due to commence, that the shepherd discovers that they are no longer pregnant. When abortions occur later in pregnancy, the affected ewes may exhibit no sign

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other than the presence of a slight sanguineous discharge at the vulva. On certain farms, the great majority of abortions occur during the last few weeks of pregnancy, in which case retention of the placenta is common. Not only are heavy losses experienced because of the actual abortion, but, on severely affected farms, even the lambs which are carried full term are weakly at birth and do not thrive satisfactorily.

It has been observed that, on some farms, the greater proportion of abortions occurs in gimmers, but, on others, the incidence is approximately equal among all ages of the ewe flock. No immunity appears to be developed in aborted animals, and cases are recorded in which particular ewes have aborted at several successive pregnancies; but it is the general experience that, as soon as the older ewes (which are cast at about five years old) are removed to non-affected areas, they do not again abort. A number of farmers are of opinion that the practice of "wintering away," and also of feeding the ewes on concentrates throughout the period of pregnancy, tends to reduce the abortion rate, but the evidence on this point is of a very conflicting nature.

Original Observations

In the following text, investigations which have been carried out in collaboration with Professor Henry Dryerre are briefly presented in summary form. The inclusion of detailed protocols has been advisedly avoided, since it is here intended to indicate only the nature and the results of the present research.

Serum samples from a number of affected ewes were subjected to the agglutination test to determine the possibility that the disease was associated with *Vibrio foetus*, *Bacterium abortus ovis* or *Brucella abortus* infection. The results were entirely negative. In addition to these enquiries, bacteriological examination of the stomach contents and heart blood of aborted foetuses failed to reveal the presence of any organism which could be considered as a possible causal agent.

The conditions of occurrence, especially the definite enzootic character of the abortion, suggested the possibility that the disease did not represent an infective process but rather that environmental conditions were the responsible causal agents, and it was therefore considered possible that the actual exciting factor might represent a dietary deficiency.

A complete biochemical analysis of the blood of aborted ewes revealed only the constant occurrence of some degree of hypophosphataemia. Although the blood of hill ewes is commonly low in phosphate, the results of these examinations suggested to us the possibility that aphosphorosis was associated with the disease.

Accordingly, in 1931, there were selected for experiment two farms upon which the annual abortion rate was known to have approximated 10 per cent. over a period of many years. On one of these farms a group of 40 ewes was formed and these received, in addition to the ordinary grazing, a supplementary ration of a quarter of a pound bran per head per day throughout their period of gestation. On the other farm, on which the conditions of occurrence were similar, a group of 40 ewes received daily supplementary rations of half a pound of maize and bone meal. In each case the feeding was commenced shortly after the rams were put to the ewes and was continued throughout the period of pregnancy. Phosphate licks were also made accessible to the test ewes. As in both farms the incidence of the disease was regular throughout the entire flock, the remaining ewes, numbering approximately 800, were regarded as controls.

At the commencement of the experiment and at monthly intervals throughout its course, blood samples were collected from members of the test groups, and from members of the remainder of the ewe flocks which served as controls. It was found that, although the phosphate ration restored the phosphate imbalance and the test ewes were distinctly superior in physical condition as compared with the control ewes, their abortion rate was not reduced.

Since, as has been indicated, there appeared to be some evidence that the disease was less prevalent during those seasons in which the growth of young grass developed early, it was then resolved to test the effect of feeding accessory food factors, and it was considered that if the disease was associated with an avitaminosis, there was a likelihood that the vitamin concerned would prove to be A, D or E. During the 1932 breeding season, therefore, a preparation containing these vitamins in high concentration was obtained and this was fed daily, mixed with bran, to 40 ewes on an affected farm. Three of the test ewes refused to take the feed and an additional ewe in the group was later found to be "tup yeld"; thus, the test group consisted actually of 36 pregnant ewes. In this group only one ewe aborted; that is, approximately 3 per cent., while in the remainder of the ewe flock, that is, the control sheep, abortions occurred at the rate of approximately 13 per cent. On statistical analysis, it was found that the chance of this difference being a random one was less than 1 in 12. In view of this experience, it was considered proper to repeat and extend this experiment.

During the 1933 season, on six selected farms, approximately 900 pregnant ewes were fed vitamins A, D and E, alone and in combination. The control ewes were approximately 1,500 in number. On the completion of the tests it was found that, in the test group, 6·2 per cent.

aborted and, in the controls, the abortion rate was 10·5 per cent.

The results of these experiments were disappointing, because, although a percentage reduction in the abortion rate occurred in the test ewes, the results obtained on the different farms were markedly irregular, and the total percentage reduction did not therefore appear to be significant. It was of interest to note, however, that on the same farm as that on which the 1932 experiment was conducted, and on which vitamin E alone was again fed to a group of 40 ewes, no abortions occurred in the test group, while the incidence of abortion in the controls was 14·9 per cent. In view of the apparently favourable results obtained with vitamin E on this particular farm, the flock was again employed during the 1934 season, for the purpose of carrying out a more extended observation. Accordingly, three groups, each consisting of 40 ewes, were formed. In one group, vitamin E was fed daily; in the second, the vitamin was injected subcutaneously at the commencement of pregnancy; in the third group, the vitamin was injected subcutaneously at the commencement of pregnancy and again five weeks later. The controls numbered approximately 700. On another farm a test group of 100 ewes were fed vitamin E in combination with an iron compound, 140 ewes being employed as controls and, on two additional farms, various minerals: iodine, iron, phosphorus, calcium and sodium chloride, were fed to 300 ewes, with 760 ewes employed as controls. The results were again disappointing as in none of these experiments was any reduction in the abortion rate obtained.

In view of these failures to obtain any significant reduction in the abortion rate by the administration of minerals and vitamins, it was decided that during the 1935 season, the effect of increasing the protein intake should be tested under controlled conditions. The increased protein intake was effected by feeding:

(*a*) A mixture of special " cold cured " blood and bone meals, the protein content of which was 41 per cent. This was fed at the rate of one to three ounces per head per day.

(*b*) Dried grass with a protein content of 12 per cent., fed at the rate of four to six ounces per head per day.

Three lots of ewes, numbering 360, received the blood and bone meals, and one lot of 95 received the dried grass. No significant reduction in the abortion rate was obtained in these experiments.

Discussion

The experiments described are to be regarded as preliminary to the further investigation of enzootic abortion in ewes. While they are almost wholly negative in character, they do not, in our opinion, negative the tentative hypothesis that the disease results from environmental factors as distinct from an infective process. It would appear that the act of abortion can with comparative ease be induced in the ewe by a number of factors involving acute metabolic disturbance. In this connection there may be instanced the well recognised form of abortion which in some districts can be induced almost at will by allowing ewes to eat down a break of turnips during cold, wet weather.

The possibility that affected pastures contain plants or plant-fungi which exert abortifacient action has not been overlooked, but, so far, no evidence of the presence of these has been obtained.

No serious bacteriological investigations have yet been made and the general pathology of the condition awaits systematic study.

Summary

1. A form of enzootic abortion in ewes is described.

2. The conditions of occurrence of the disease suggest that it is associated with local environmental factors.

3. Experiments, negative in their results, designed to determine whether the disease is associated with deficiency in intake of minerals, vitamins or proteins are discussed.

Acknowledgments

Professor Dryerre and the writer are indebted to Mr. J. Gillray McGregor, Stirling, for furnishing them with a copy of a report upon the conditions of occurrence of the disease. The report, which is dated 1910, is believed to have been compiled by an officer of the then Board of Agriculture and Fisheries. Their colleague, Mr. D. R. Wilson, has carried out a number of blood agglutination tests with *Vibrio foetus*, *Bacterium ovis* and *Brucella abortus* antisera.

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[1]Report of a Departmental Committee appointed by the Board of Agriculture and Fisheries to enquire into Epizootic Abortion. 1910, part 1; 1913, part 3.

[2]Bosworth, T. J., and Glover, R. E. (1925.) Contagious Abortion in Ewes. *Vet. J.* 81. 319.

[3]Second Report of Committee appointed by the Highland and Agricultural Society of Scotland. *J. Comp. Path. & Ther.* 1889. 2. 97.

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The Experimental Pathology Section met at 10 a.m. on the second day of Congress, Tuesday, September 15th, and under the Chairmanship of the President of the Section, Major T. Dalling, M.R.C.V.S., of Beckenham, for the purpose of discussing the foregoing paper.

Invited by the Chairman briefly to introduce his paper, Dr. J. Russell Greig observed that he supposed that it would be generally agreed that

our knowledge of ovine pathology had been extended considerably during the last 15 years or so. Then, when organised research was first applied in the field, veterinary science was confronted with a number of well-recognised problems in the diseases of sheep. Such diseases, for example, as lamb dysentery, braxy, scrapie and louping-ill, were awaiting investigation but it was also true—and they had come to realise this especially in recent years—that there was a number of conditions, the existence of which was quite unrecognised, although they were of real economic importance, and the condition which was under discussion that day was one of these. He felt that he should almost apologise for the paper because it gave so incomplete an account of the nature of the disease. It was not a story; it was just the commencement of a story, and it might serve its purpose in stimulating further clinical observations on enzootic abortion.

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Discussion

Mr. T. J. Bosworth (Cambridge), who opened the discussion, said:

Although abortion in the ewe is not perhaps one of the most serious diseases with which flock-owners in general have to contend, all who are connected with sheep farming will agree that it is a troublesome condition which is apt, at times, to cause considerable losses, particularly in certain districts. The knowledge that it has been prevalent in parts of Yorkshire for a number of years past may perhaps have influenced the Provisional Committee of this Congress in deciding to ask Dr. Greig to contribute a paper on the subject. Unfortunately it is not possible to form an exact opinion as to the economic importance of this disease for no figures are available on which a reliable estimate can be based. Anyone who has been interested in the subject for any length of time, however, must have been sufficiently impressed with what he has observed to realise that if full data could be obtained they would be quite impressive. There is no doubt that many cases occur which are not reported by the farmer who often regards them as purely accidental and is not inclined to take action unless they prove to be either very numerous or very persistent. The contagious form of the disease particularly is apt to be very intermittent and experience has shown that flocks in which an outbreak has occurred usually remain free for several years afterwards.

When we come to consider the aetiological factors involved we have to recognise that, although several types of bacteria are known to be capable of producing a contagious form of abortion in the sheep, numerous cases occur which cannot be ascribed to any known infective agent and which are the result of some other agencies at present undefined. It is, therefore, gratifying to learn from Dr. Greig's paper that a serious attempt is being made to study this problem. The fact that his efforts have so far proved unsuccessful in no way minimises the value of the work which has been undertaken for it is evident that experimental data alone can help to clarify the situation as it exists at present, in which only plausible theories can be advanced by way of explanation. In reality, little intensive work in this field has yet been carried out but the need for it is emphasised by the facts which Dr. Greig has brought forward in his paper.

We ourselves have often had negative results in carrying out tests for specific agglutinins on samples of blood submitted to us from ewes which have aborted in several districts in England. On the other hand the vast majority of outbreaks which we have investigated personally during the last thirteen years have been found to be due to a specific organism but these have mostly occurred in animals kept under intensive conditions of sheep husbandry and which appear to be more often subject to bacterial infections of this kind than those on wide expanses of hill grazing. In Germany, Miessner (1929) has stated that during the years 1927-29 about half the cases of which he has records were non-bacterial and in 1929-31 a very much higher percentage were of that nature (Miessner and Köser, 1931).

Numerous causes, apart from bacteria, have been held to be responsible for abortion in sheep. Dr. Greig has sought to find the explanation in a dietary deficiency and his deductions from the circumstances under which the condition occurs in the areas where he has been working suggest that this is by no means unlikely in the absence of any demonstrable infective agent. It is still a common belief that fright occasioned, for example, by dogs, guns, and in recent years by low flying aeroplanes, may cause it. Zwick (1930) mentions that unfavourable weather conditions and damaged, mouldy fodder may be factors of importance. Miessner quotes Pröscholdt as having observed numerous abortions following the consumption of mouldy hay and as being of the opinion that prevention depends mainly on eliminating faulty feeding and management. Welch and Marsh (1924) state that many American farmers are inclined to blame the feeding of too much cotton-seed meal, whilst Miessner and Köser (1934) mention that technical by-products used as fodder, *e.g.*, distillery refuse and rape-seed cake, sometimes cause numerous abortions. Some English farmers blame too many turnips. We have observed one very extensive outbreak, which was not of a bacterial nature, in a flock which was in very low condition; the animals were kept on extremely poor land and were heavily infested with parasites. Mere poverty of condition in itself, however, will not necessarily

cause ewes to abort as is illustrated by the fact that, on hill pastures after a really hard winter, they may be very debilitated and yet produce viable offspring. Lastly, it may be mentioned that, since carbon tetrachloride may give rise to abortion, the use of this drug should be avoided during pregnancy.

It must be admitted that the explanation most likely to account for numerous cases of non-infectious abortion occurring in a particular area is that which assumes that the ewe is not obtaining in her food some factor which is essential to the existence of the foetal lamb, unless one postulates the intake of some substance which has a toxic effect on the latter. It is widely believed that malnutrition may be responsible for animals not coming into oestrum or failing to conceive or producing relatively small numbers of lambs, and no doubt it will be generally agreed that there is a distinct correlation between the plane of nutrition and fertility of sheep in various districts in this country. It is not, as is sometimes supposed, entirely a question of the breed of animal concerned, since hill sheep, when transferred to good lowland pastures, readily produce twins although they rarely do so in their native districts. It is evident, therefore, that nutrition is an important factor in this connection. Steffens (1936) has recently stated that the percentage fertility of sheep in certain parts of Germany showed an appreciable decline following the dry summer of 1934 when they had to subsist on rough innutritious herbage deficient in vitamins and other constituents.

Turning now to the causes of infectious abortion, we see that Dr. Greig has mentioned, in what one believes to be their probable order of importance, the three organisms most commonly concerned, *viz.*, *Vibrio foetus*, *Salmonella abortus ovis* and Brucella all of which may give rise to the condition in an enzootic form. There are, in addition, others which have been described as causing sporadic outbreaks, *e.g.*, Streptococcus (Miessner and Köser, [1931], Marcis [1934]), *Bact. coli* (Miessner and Köser [1931], Howarth [1932], Pasteurella (Manninger [1918], Marcis [1934]) and Corynebacterium (Hindmarsh and Blumer [1932]). In this country *V. foetus* and *S. abortus ovis* appear to be the only two types which have been incriminated. From one outbreak we have isolated a pasteurella-like organism but we are not yet in a position to give a final opinion as to its significance. In Germany, *S. abortus ovis* appears to be by far the most common infective agent but a few cases occur which are due to *Br. abortus*, *V. foetus*, Streptococcus and *Bact. coli*. Marcis states that Brucella does not as a rule cause abortion in sheep in Hungary and that Pasteurella, Salmonella and Streptococcus are only occasionally responsible. There, the most important agent is *V. foetus*. In France, the three main types mentioned above have been encountered, while cases due to Brucella occur in countries bordering the Mediterranean. In Cyprus, Manley encountered *S. abortus ovis*. Most of the outbreaks recorded in the United States of America have been due to *V. foetus* though in one case described by Howarth the causal agent was *Bact. coli*. The only instance in which a member of the Corynebacterium group appears to have been concerned occurred in Australia.

Vibrio foetus.—There is reason to believe that this organism is fairly widely distributed among sheep in England for we have isolated it from material sent to us from many districts. The organism was first described by M'Fadyean and Stockman as a cause of abortion in this animal and was afterwards found also in cattle. A feature of the cases described by these authors was the fact that affected ewes frequently showed evidence of uterine discharge for some days prior to the act of abortion and the foetuses when expelled were consequently decomposed, thus adding to the difficulty of diagnosis. In most of the cases of this kind which we have examined, however, the lambs have been quite fresh when cast and have yielded pure cultures of the organism. It is quite possible, of course, that we may have overlooked it on occasions when examining decomposed specimens but as far as one can judge from the results of testing the serum of ewes from which these have been obtained, this has not happened very frequently.

In examining a freshly aborted lamb one finds subcutaneous oedema and the body cavities contain a considerable excess of blood-stained serous or sero-fibrinous fluid. In some cases the peritoneum is filled with blood as the result of rupture of one of a number of pale necrotic areas in the liver, which organ may be considerably enlarged as a result of diffuse hepatitis. Presumably such liver changes correspond to those originally described by Carpenter and subsequently by Marcis. Some inflammation of the stomach and intestines may also be observed. In making a bacteriological examination care is necessary in order to avoid overlooking the presence of the organism. This applies to both smears and cultures. The former are best stained with dilute carbol-fuchsin for at least ten minutes while dark ground illumination of fresh material may be useful. Primary cultures should be made on serum agar and incubated for at least seven days in an atmosphere containing 10 per cent. CO_2. This precaution may not be absolutely necessary when the medium is richly seeded with original matter but it is essential in the case of the first few subcultures. Growth may be evident to the naked eye only by some turbidity of the water of condensation or the presence of a fine film between the medium and wall of the tube though distinct colonies are seen in some cases.

In the absence of any visible evidence of growth, however, it may be possible to find the organism in smears made from the surface of the medium and these should always be prepared before the case is regarded as negative. These details are given because it is realised how easily this organism may be overlooked and to stress the desirability of examining several aborts from every suspected outbreak. In maintaining cultures and also in obtaining sufficient growth for the preparation of suspensions, difficulty may also be experienced. Several workers have found that the organism survives for a longer period at room temperature than when stored in the cold, and under the former conditions on sealed agar slants it has in some cases been shown to be alive after 74 days (Welch and Marsh). We have found that it may survive for a period of two months in meat broth medium. Suspensions for agglutination tests are best prepared from surface growths since the organism produces only a very faint haze in broth cultures. To ensure abundant growth on a solid medium some enrichment fluid is necessary and we have obtained the best results by using agar to which has been added 10 per cent. of a watery extract of the tissues of a foetal lamb or of chick embryo. The tubes or flasks must be sealed in order to keep the medium moist and it is an advantage to flood the surface at intervals with the water of condensation. Within fairly wide limits the reaction of the medium appears to have little effect, for the organism will grow quite readily over a range of from *p*H 5·8 to *p*H 7·8.

The agglutination test is of value in diagnosis. The blood of normal ewes seldom, if ever, agglutinates the organism at a dilution of 1: 20 and, in some cases, that of animals known to be infected likewise gives no reaction. The latter, however, usually show titres of from 1: 20 to 1: 200.

It is generally believed that the chief means by which sheep become infected with *V. foetus* is by the ingestion of contaminated food and water. Marcis believes that infection is most likely to occur when bodily resistance is lowered by disease, bad feeding or management. Carrier animals are in all probability the chief means by which it is introduced into a flock and Buxton (1929-30) has described an interesting case in which there was strong presumption that a ram, which was shown to be infected, acted in this capacity. The possibility that cattle may spread infection must not be overlooked. One attack of the disease appears to confer immunity, for it is rare for it to occur in a flock for more than one season.

Salmonella abortus ovis.—This organism has been responsible for outbreaks of abortion in this country mainly in the eastern counties though both Watkins, of Seale-Hayne, and Menzies, of Bristol, have encountered cases in their respective areas. Beyond this its distribution is uncertain but it seems rather unlikely that it is as limited as the known facts would appear to indicate. It was first recognised by us in 1924 (Bosworth and Glover, 1925) quite close to Cambridge, and during that year and until 1931 we were aware that it was responsible for very heavy losses indeed in Cambridgeshire, Norfolk and Suffolk. Since then, as far as our information goes, it appears to have been less troublesome, but no season has passed without some cases being reported and it may at any time again become a serious problem. In this form of the disease there are usually no signs beforehand that an animal is likely to abort. As a rule the flock appears perfectly healthy until about six weeks before lambing is due to begin, when abortions suddenly commence and within a few days quite a large proportion of the ewes may have cast their lambs. The aborts are always perfectly fresh and there is no difficulty in isolating pure cultures of the organism from almost any part of the body. In rare cases the lambs may be carried almost to full term, when they are born dead. In some instances ewes die as the result of septic metritis and peritonitis following abortion.

Since the organism is not known to occur in any other species of animal, it is probable that carrier sheep are the chief means of spread. In a few instances we have obtained evidence that sheep purchased from infected flocks have been responsible for fresh outbreaks and in others there has been strong suspicion that infection has been introduced in this way. At the same time there are many points in connection with the carrier state which have not yet been determined. It is known, however, that infection spreads very rapidly through a flock when a carrier is introduced, and in a short time the majority of animals develop an agglutinating titre which is significant. The agglutination test is, within limits, a useful method of diagnosis provided one pays due regard to the qualitative estimation of the agglutinin content of the serum.

One attack of the disease results in the development of a strong immunity for we have never observed cases to occur in a flock the year following the original outbreak except among animals which have been introduced in the meantime. In order to keep flocks free from infection, animals purchased from sources which are not known to be free from suspicion should be isolated until they have been blood-tested.

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Mr. N. S. Barron (Reading University), observed that of three cases that had come to his notice one was of particular interest. Out of a breeding flock of 120, 40 ewes were in a certain pasture and were receiving only a limited quantity of hay. The others were receiving concentrates right up to the time of lambing. In the batch of 40 there were no abortions, but 25 per cent. of the ewes fed concentrates threw premature lambs commencing three weeks before full time. It was a common idea amongst some farmers that it was not wise to feed concentrates in the afternoon and that the amount of hay should be limited, the idea being that the ewes, having had hay *ad libitum*, and concentrates later, settled down for the night with a full rumen which exerted pressure on the uterus. This idea was not unreasonable and was worthy of consideration in cases where no more definite cause could be discovered.

Mr. W. Lyle Stewart (Newcastle-upon-Tyne) said that he desired first of all to congratulate Professor Russell Greig on bringing to their notice a condition which constituted a real problem on many sheep-breeding farms. As Mr. Bosworth had shown them that day, the causes of abortion in sheep were many and various, but in the northern counties he (Mr. Lyle Stewart) had come across many outbreaks of ewe abortion, and he had not yet isolated either the *Vibrio foetus* or the Salmonella organisms. In this connection he might add that in most of these outbreaks blood samples had been taken but the results of these tests had always been negative. He therefore could support Dr. Russell Greig in saying that the above micro-organisms had not yet been seen in the north of England. Perhaps the fault lay in the agglutination tests, which might not be sufficiently delicate.

In 1927 he had 50 per cent. of his experimental ewes abort, and it was only recently that he had learned the cause. These sheep had all been brought while pregnant on to land infested with the sheep tick (*Ixodes ricinus*) and he felt quite sure in the light of later experience that the cause of these abortions was tick-borne fever; it would appear, therefore, that tick-borne fever was yet another cause of ewe abortion, being particularly liable to occur among unacclimatised sheep brought on to louping-ill pastures during the tick season. This fact was well-known to hill farmers, who, however, confused the disease with contagious abortion.

With regard to the type of abortion of which Dr. Greig had made a special study, he was quite ready to agree that it occurred to a greater or less extent on many sheep farms in the north of England, and on individual farms the disease presented a serious problem. The type of farm affected was generally the hill farm, and abortions appeared to occur soon after the New Year. That the ewes were not "tup-eild" was known by their poor condition, but, in general, the aborted lambs were never found. These ewes were only known to be eild when turned by the shepherd at lambing time. The act of aborting did not, so far as he knew, cause any noticeable illness in the ewes. In outbreaks of ewe abortion caused by the infective agents mentioned by Mr. Bosworth, the ewes suffered a considerable and rapid loss in condition and there was frequently much discharge from the vulva.

He was sorry that he himself had no experimental data on which to offer an opinion as to the cause of this type of abortion. Inasmuch as it was now known definitely that many hill farms are deficient in essential food constituents, it was possible that the cause would be found to be dietetic, and he wished Dr. Greig every success in prosecuting his enquiries to a definite conclusion. (Applause.)

Major T. G. Heatley (Woodbridge) said that he came from Suffolk, where sheep culture was fairly extensive, and he was often asked: "How far will ewes be affected as regards abortion through being folded on turnips which have been heavily manured with artificials; can the composition of the turnips be affected by the extensive use of such artificial manures, so introducing some factor inducive of abortion? People went so far as to say that when these turnips were pulled the lambs were blackened, from which it would appear that there was some foundation for the suggestion that the chemical composition of the turnips was altered; certainly it was a fact that where ewes were folded on such turnips there was always a larger proportion of abortions than usual.

He had also found that in certain places where abortion was fairly prevalent the only way in which the farmer could ensure comparative freedom from the disease was by making his replacements from his own flock; in that event he did not get many abortions another year. It was generally said by the shepherds, as a result of observation, that a certain portion of the fields was dangerous for sheep—namely, low-lying ground, known locally as the "swale"—for on such damp places abortions were frequent and occurred fairly quickly; *i.e.*, early in gestation. Another point was that if the field had a piece of ground upon which there had been a muck-hill the character of the turnips grown there was altered and bad results followed from feeding them.

He wished Dr. Greig to explain those few points, if he could do so, for such information would be of material assistance to him in replying to his enquirers.

The Reply

Dr. J. Russell Greig said that Mr. Bosworth, in his excellent opening of the discussion, had indicated a number of factors which could be concerned in the causation of abortion in ewes. As he had suggested in the paper, he believed that any factor which was responsible for acute metabolic disturbance could produce abortion in the ewe. They knew and had recognised in Scotland for a long time that abortion could be associated, especially in hill ewes, with malnutrition; they also recognised that it could be associated with specific infections such as tick-borne fever, as mentioned by Mr. Lyle Stewart.

He was interested in the observation of Mr. Barron but was unable to offer any definite opinion upon it. Major Heatley directed

particular attention to the turnip in relation to abortion in ewes. This was an important point and one that was well worthy of further investigation because numerous outbreaks of abortion in ewes in Scotland were definitely associated with folding ewes on turnip breaks especially during cold, wet weather.

He was glad to know that Mr. Bosworth felt that the assumption that they were dealing with a possible dietary deficiency was justified. This, however, could only as yet be an assumption.

He (Mr. Bosworth) had discussed the contagious forms of abortion due to the *Vibrio foetus* and to the *Bacterium abortus ovis*. Characteristic features of these forms of abortion were their periodic occurrence and the fact that they were followed by a solid immunity. Enzootic abortion, on the other hand, differed from the infective epizootic forms in that it occurred only in particular areas over long periods of time and the condition was followed by no appreciable immunity.

Dr. Greig felt that the discussion had brought out an important point in regard to the relative geographical distribution of the infective epizootic forms and the enzootic form. Although there was presumptive evidence that the infective forms had occurred in Scotland, they had, so far, consistently failed to obtain evidence of their presence there. This, he understood, had also been the experience of Mr. Lyle Stewart in the north of England, where, however, the enzootic abortion such as they were discussing, was well recognised. On the other hand, while the infective forms of abortion prevailed in the south of England, particularly in the eastern counties, so far the enzootic type, if it existed, had remained unrecorded.

He hoped that his paper, in drawing attention to the existence of enzootic abortion, might be the means of bringing about the recognition of the disease in areas in which it was still unrecognised and he hoped, too, that at some time in the future, someone—it might be someone other than himself—would be able to present a much more complete account of the aetiology and the nature of enzootic abortion in sheep.

POPULARITY OF ZOOS

Dr. Julian S. Huxley, Secretary of the Zoological Society of London, speaking at the centenary dinner of the Bristol, Clifton, and West of England Zoological Society, said that the present-day popularity of zoos was due partly to the desire for healthy and stimulating entertainment in an age when leisure was more abundant, and partly to the fact that the importance of biology was being increasingly recognised. Some people thought that the "soft pedal" should be put on the entertainment factor of a zoo, but he did not agree. A zoo was, in a sense, a business with science tacked on one end and a circus on the other. The educational function of a zoo was almost inseparable from entertainment, and he hoped that zoos would follow the example of museums and supplement their task of being living museums by showing films of animals in their natural surroundings.

Bristol Zoo, he added, was the first to breed lions to any large extent; the first to put monkeys in an open-air cage (now thought to be the best way of keeping them healthy); the first zoo in Europe to breed a chimpanzee, and was the possessor of the longest-lived gorilla in captivity.

General Article

BLOOD AND SALINE TRANSFUSION IN HORSE AND CATTLE PRACTICE

R. S. AMADON*

Prevention of disease, rather than treatment, is the goal toward which modern veterinary medicine is constantly striving. Although a considerable degree of success has attended this effort there is nevertheless frequent necessity for the administration of therapeutic aid to the individual or simultaneously to a group of veterinary patients, thus denoting the fact that preventive medicine must be supported by therapeutic care of the animal, or animals, that have contacted disease producing agencies.

It appears quite essential, therefore, that the inadequacy of preventive medicine be compensated for by more highly efficient diagnostic and therapeutic procedure. There is a vital need to-day for modernisation of these phases of veterinary science—a need which demands research effort devoted to the attainment of new knowledge or the evaluation and adaptation of knowledge already existent and of proven worth in the field of human medicine.

Turning our attention to the subject of this paper it may be stated that blood and saline transfusion procedure is a very good example of an exceedingly valuable means of treatment which has become fully established in human medicine but which is applied in veterinary practice only on rare occasions.

Indications for Blood and Saline Transfusion

In human practice the following disease conditions are treated by means of transfusion procedure: haemorrhage and circulatory shock, haemorrhagic diseases, debilitated conditions, blood diseases, toxaemias and infections. The veterinarian is confronted daily with the problem of dealing with one or more of these above listed diseases. The indications that have been instrumental in the development of the theory and practice of transfusion in human medicine are of the same vital importance in veterinary medicine. Restrictions are frequently imposed upon the extent of treatment of those animals having definite value in dollars and cents without sentimental consideration being involved. However, the valuable horse, ox, or pet animal offers opportunity for extended effort on the part of the veterinarian and it is in the handling of such cases that his ability is given full opportunity for recognition.

Transfusion is a remedial measure indicated for the restoration of the functional activities of the blood and the circulatory system. These

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activities consist of the transport of all materials needed for the energy, growth, and repair metabolism of the tissues and also the carrying of metabolic waste substances to their respective portals of excretion. A transfusion of blood serves to improve the quality of the patient's blood and may also be of value in increasing the quantity of blood. Quality of blood refers particularly to the number of erythrocytes present and the amount of haemoglobin contained in those cells which are concerned in the transport of oxygen and carbon dioxide. Changes in quantity, such as occur in severe haemorrhage, also reduce the total amount of haemoglobin present and, consequently, will inactivate the gas transporting power of the blood to a marked degree. Of particular significance is the disturbance in circulatory function which appears when a certain amount of blood loss has occurred and the volume has been reduced to the point where the contractile force of the heart muscle and the arteriole muscle can no longer maintain the necessary head of pressure to drive blood through the capillary portions of the circulation. A saline transfusion is of value in correcting volume reduction but, of course, it does not serve as a means of improving the quality.

Blood Transfusion—Selection of the Donor

In man, care must be exercised in obtaining a donor whose blood is free of haemoagglutinative and haemolytic properties when mixed with the blood of the patient (recipient). Any tendency of the blood cells to agglutinate is dangerous, due to the obstruction of various parts of the circulation. Careful matching of serum and cells of the donor against serum and cells of recipient is always practised in arranging for a blood transfusion.

The question concerning the existence of type characteristics in horse or ox blood has been the object of some study in our laboratory. The blood samples of some one hundred horses and a similar number of cattle have been typed by the macroscopic slide method. The results of this survey revealed the fact that horse blood quite frequently possesses strong haemoagglutinative properties while cattle blood is apparently lacking in these properties—ox blood samples consistently failed to exhibit any evidence of an agglutination reaction with the above mentioned method of typing. On the basis of these observations we feel assured in concluding that horse blood should always be typed to insure freedom from serious or fatal reactions in transfusion work. In cattle practice an examination for type is unnecessary.

Blood Typing Technique

Typing of blood is a simple procedure that can be successfully carried out with the equipment available in the office of any practitioner. The procedure, outlined as follows, has proved to be the most practical and reliable:—

(1) Draw a 10 c.c. sample of blood from recipient and also the same amount from two or more donors or such donors as may be available. Collect blood in test tubes and set aside to clot.

(2) Decant serum from each test tube in small test tubes numbered according to sample.

(3) Add 5 c.c. of 0·85 per cent. sodium chloride to the blood clot in each of the collection tubes and shake until the salt solution is bright red with suspended erythrocytes. Decant this cell suspension into tubes numbered according to the sample.

(4) Place a medicine dropper in each of the serum and cell suspension tubes.

(5) On a piece of clear window glass place two drops of the recipient's serum at intervals along one side, the number of these serum deposits corresponding to the number of cell suspension tubes.

(6) In the first serum deposit place a drop of the recipient's cell suspension, using the remaining serum deposits for the cells of the prospective donors. In the first deposit, the recipient's serum and cells are combined and, consequently, should always be negative and thus serving as a control in reading the remaining combinations.

(7) Mix the cells and serum thoroughly in each combination by stirring with tooth picks or match sticks using a fresh pick or match for each combination.

(8) Tilt the glass plate back and forth for a period of five to ten minutes to prevent sedimentation of the blood cells. Ten minutes is the maximum interval of time required for observation.

A negative reaction is indicated by the serum-cell combination maintaining a homogeneous appearance. The erythrocytes of horse blood tend to assume rouleaux or the pile of pennies formation that often gives the combination a faintly granular appearance that may be confused with a weak agglutination reaction. This is to be disregarded as it is not associated with agglutination and will probably be observed to occur in the control combination.

A positive reaction is marked by the pronounced clumping of blood cells giving the serum-cell mixture a coarsely granular appearance; or, if the reaction is very pronounced, the cells may all aggregate into a single central mass which resists separation when the glass is jarred by slight blows on the edge by the palm of the hand. The clear serum will be observed surrounding the clump or clumps of agglutinated cells.

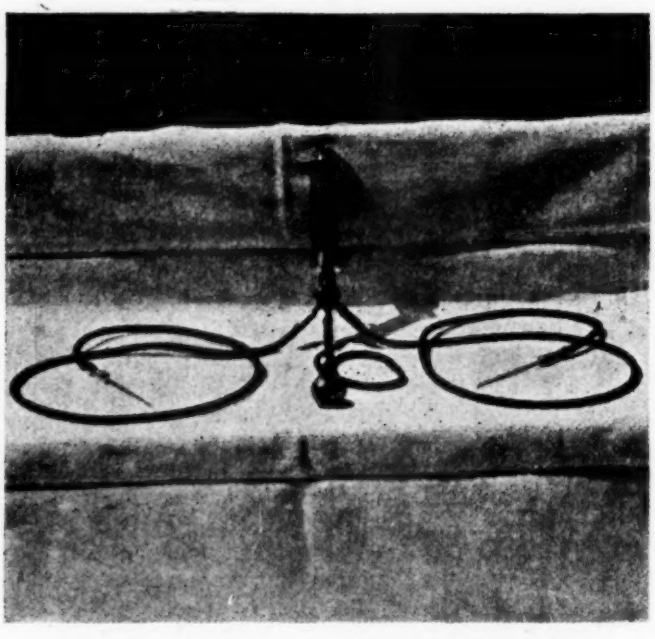
Such a positive reaction of the donor's cells in recipient's serum contra-indicates the use of such blood for transfusion. It must be remembered that blood cells and capillary blood vessels are of microscopic dimensions so that macroscopic clumping of blood cells indicates that thrombosis will occur in the first capillary

area entered. The pulmonary capillaries constitute the initial point of obstruction to the passage of quickly agglutinated blood cells administered per vein, and vital nerve centres, such as the centre for respiratory control in the medulla, will be protected to a considerable degree.

The serums of the donors may be typed against the recipient's cells in order to assure complete compatibility. This, however, is less important than the determination of a complete absence of agglutination of donor's cells by recipient's serum. The donor's serum may be strongly agglutinative for the cells of the recipient but it may cause no disturbance unless a massive transfusion is given. This is explainable in terms of dilution effects reducing the agglutinative power of the serum, as a relatively small amount of donor's serum is mixed with a large amount of recipient's blood. The reverse relation exists regarding the donor's cells, and any tendency for agglutination of these cells by the recipient's serum remains unmodified by the slight dilution effected in the course of the transfusion.

Transfusion Technique

Transfusion may be accomplished by direct or by indirect methods. In direct transfusion the blood transfer is accomplished immediately from animal to animal with no exposure of the blood to external environment and with no modification of the blood. The indirect method



The Scannell Transfusion Apparatus

involves a certain amount of delay in the transfer procedure, the blood being collected from the donor in an appropriate container and later introduced by gravity or pressure injection into the circulation of the recipient. In this method, it is necessary to modify the blood by the use of anticoagulant drugs or by defibrination, in order to prevent coagulation.

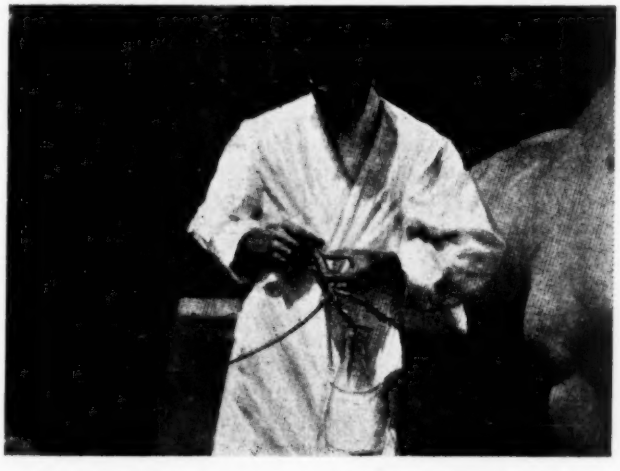
Direct Transfusion

This procedure requires that the donor's and the recipient's circulation be brought into communication by means of tubing. A syringe is introduced to provide motive power for a flow of blood from one circulation to the other. A great variety of direct transfusion equipment is available for use in human medicine, some of which, by slight modification, is adapted to the needs of the veterinarian. We have used the Scannell syringe for transfusion of the horse and it appears to fulfil all of the requirements for such work. This syringe as offered by the MacGregor Instrument Company consists of a 20 cubic centimetre syringe to which is attached a three-way valve that makes possible the establishment of communication between the syringe and donor, syringe and recipient, or syringe and saline solution container, or the exterior, if desired. This type of valve enables the operator to flush the barrel of the syringe if there is a tendency for the plunger to adhere to the walls. It also affords an opportunity for discarding a syringe full of blood that may be undesirable for injection. The calibre of the valve openings, syringe nipples, and the tubing connections is of such diameter as to offer a minimum amount of resistance to the passage of blood, thus reducing the extent of injury to the cellular elements and, consequently, the tendency to coagulate. The syringe is provided with a large finger ring which enables the operator easily and safely to support the syringe in one hand while operating the piston of the syringe with the other.

Direct Transfusion with Scannell Syringe

Direct transfusion in the horse presents no difficulties as the necessary restraint, particularly of donors, requires little effort. In cattle, trouble may often be experienced in securing

the desired degree of immobilisation of donor, as the ox is more resistant to restraint and venous puncture than the horse. In our use of the Scannell apparatus we attached three feet of tubing to the donor and recipient nipples of the three-way valve, thus allowing a range of six feet for the manoeuvring of the animals. Cattle secured in stanchions provide the most satisfactory conditions of restraint and do not require more than the above mentioned six feet of tubing connection. The large, easily accessible, jugular veins and the slow coagulation time normal to these species are factors that contribute to the feasibility of direct transfusion in bovine and equine practice.



Direct Transfusion.—Note the jar of saline solution in coat pocket

Indirect Transfusion

The Citrate Method.—Sodium citrate is a very satisfactory anticoagulant as it removes the lime salts of the blood by the formation of a soluble but non-ionisable salt. Oxalates are also anticoagulants but remove the calcium by precipitation. A precipitate should never be introduced into the blood stream. A concentration of 0·3 per cent. of citrate will prevent coagulation. Citration of blood may be accomplished as follows:—

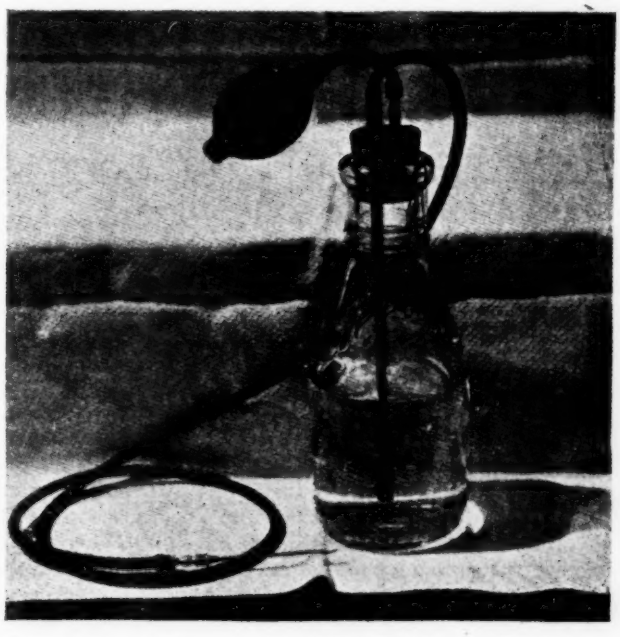
(1) In a container of known capacity (preferably a milk bottle) place a quantity of 3 per cent. sodium citrate solution equivalent to one-tenth of the total capacity of the container.

(2) Complete filling of the container with blood drawn as rapidly as possible from the jugular vein. Move the container during the course of the filling to ensure a good mixture of the blood and citrate solution. With completion of the filling, the container is filled with a volume of blood and citrate solution, the concentration of sodium citrate now being 0·3 per cent.

(3) Place container of citrated blood in warm water to maintain a temperature equivalent to that of the body, or slightly above, until ready for injection into the recipient's vein.

We have found the following equipment very practical and satisfactory for indirect transfusion work in horse and ox:—

A milk bottle constitutes our container, it being closed with a No. 26 two-hole stopper. One hole of this stopper is fitted with a ten inch length of Monel metal tubing having an outside diameter of 7/25 inch; the second hole is fitted with a two-and-one-half inch length of this tubing. Rubber tubing (3½ feet of 6/25 inch—



Attachment for use of Milk Bottle as Container in the Indirect Method

1/25 inch side wall) attached to the outlet of the short tubing adapts the bottle for gravity feed. When attached to the long metal tube and with a pressure bulb connected to the short tube, the bottle may be used for pressure injection.

The advantages of this arrangement consist of (1) the ready availability of a container under all conditions, and (2) the moderate first cost of the stopper, tubing and pressure bulb. The standard size of mouth openings in all milk bottles enables a variety of different capacity containers to be used with the same injection stopper.

A bleeding needle of six gauge calibre proves very satisfactory in the collection of blood for citration or defibrination. Although it is a needle of rather formidable dimensions it will be found that introduction into the jugular vein of the mature horse or ox is easily accomplished. It may be necessary to nick the skin but usually it can be thrust directly through the skin into the well distended vein. The rapid flow of blood favours good citration and counteracts the tendency for coagulation in the needle. In removing the needle subcutaneous

escape of blood may be prevented by, " pushing the animal off on the needle " rather than drawing the needle out. The compression of the skin against the vein wall will prevent the gush of blood that could fill the pocket of skin when the needle is withdrawn without support of the hand against the skin surrounding the needle.

For introducing the blood into the recipient a twelve gauge needle was proved to be most satisfactory. Both the bleeding and transfusing needles should be about three inches in length as the long needle can be placed in the vein deeply enough to ensure against the danger of dislodgment.

Preparation of Defibrinated Blood.—Defibrination is most conveniently accomplished by shaking, the container being filled to about two-thirds capacity to allow sufficient movement. Horse blood requires about twelve minutes for the completion of the coagulation reaction; ox blood approximately seven minutes. It therefore requires an interval of ten minutes for ox blood and fifteen for horse blood for the complete shaking out of all fibrin. The agitation of blood during the course of the coagulation reaction serves to check any clotting action as the fibrin is disorganised and becomes aggregated into masses that float on the surface of the blood. The fibrin is removed by straining the blood through a double layer of cheesecloth. The straining operation is the most objectionable feature associated with the use of the defibrinated blood as it subjects the blood to rather extensive handling which predisposes to haemolysis and contamination. In contrast the citrate method involves a minimum amount of manipulation as the blood may be drawn directly into the transfusion bottle through the tubing connection which can be immediately connected with the needle in the recipient's vein following the collection, if so desired.

Saline Transfusion

The intravenous injection of a saline solution may serve to preserve the life of an animal that has suffered severe haemorrhage or is in a state of circulatory shock. It constitutes an emergency measure as it can be applied without delay. Such solutions are isotonic with the blood cells and therefore do not injure the cells. The effects of saline transfusion tend to be rather transient as a considerable loss of the injected fluid is apt to occur through the kidneys. This may be offset to some extent by the addition of colloids to the solution to the same concentration as found in plasma. Six to seven per cent. gelatine and gum acacia are recommended for this purpose. Among the saline combinations and simple solutions the following are the most important:—

(1) Physiological salt solution.

Sodium chloride	0·85
Aqua	100·00

(2) Ringer's solution (modified).

Sodium chloride	0·85
Potassium chloride ...	0·83
Calcium chloride	0·025
Sodium bicarbonate ...	0·02
Aqua	100·00

(3) Locke's solution.

Sodium chloride	0·90
Potassium chloride ...	0·042
Calcium chloride	0·024
Sodium bicarbonate ...	0·02
Dextrose	0·10
Aqua	100·00

Amount of Blood or Saline to Transfuse

In the treatment of haemorrhage and circulatory shock the restoration of circulatory function is the primary objective and success in this respect can be determined by noting a return of the normal strength and frequency of the pulse. The transfusion fluid should be injected slowly to guard against overloading the heart muscle which has been weakened due to the inadequate blood supply. The injection should be continued until the pulse improvement indicates that the normal volume relations in the circulation have been restored.

The debilitated or tardy convalescing patient must be transfused with a sufficient quantity of healthy blood to bring about a distinct amount of improvement in the quality of its blood. The blood count and haemoglobin determination will be necessary in deciding the amount of blood to be transfused. In these cases it is often desirable to remove a generous amount of the depleted blood from the patient's circulation and replace it with an equivalent quantity of normal blood.

In purpura (horse) and sweet clover poisoning (ox) the patient usually shows marked improvement and recovery following relatively small transfusions (½-1 litre).

It may be stated in closing, that although the use of transfusion has been discussed from the standpoint of its application in horse and cattle practice, the same indications exist in small animal practice, especially in canine practice in the urban community where animals are frequently injured by automobiles and suffer severe internal haemorrhage.

VETERINARY INSPECTION IN GLOUCESTERSHIRE

At a meeting of the Gloucestershire Agricultural Committee, held last month, the report of the Diseases of Animals Sub-Committee stated that the Sub-Committee had appointed four full-time assistant veterinary officers, who would take up their appointments on October 1st.

Ten of the 14 part-time veterinary inspectors had agreed to continue after September 30th their present duties (other than those to be allocated to the whole-time officers) upon the present terms.

Abstracts

[Influence of Mastitis and of Brucella abortus Infection upon the Milk Yield of Cows. Minett, F. C., and Martin, W. J. (1936.) *J. Dairy. Res.* **7.** 2. 122-144.]

The milk yield of cows is one of the most variable characters known. While milk yield is largely influenced by heredity, "environment" also plays a part, and among the factors which contribute to "environment" is disease, particularly Johne's disease, contagious abortion and mastitis. The object of the present work was to measure the loss due to mastitis and abortion in sufficiently representative groups of cows, and to see whether it was significant in the statistical sense. Such a problem is one which has special difficulties, owing to the numerous factors which influence the milk yield. Corrections have to be made for age, length of dry period, service period (interval between calving and next effective service), and month of calving. Comparisons of yield can only be made between animals of the same breed living under the same conditions of animal husbandry and being milked by the same system—by hand or machine, as the case may be. After all these conditions have been satisfied, it has to be remembered that other diseases may have a bearing on the issue. Thus, when the influence of mastitis upon the yield is being considered, the animals must be free from abortion, Johne's disease and tuberculosis.

The literature relating to the influence of abortion and of mastitis upon milk yield is set out in the form of a table and critically reviewed. In many cases, however, it is not clear that correction factors were used, while in considering the influence of abortion many authors appear to have overlooked the effect of mastitis. It can only be concluded that in the past no exact and at the same time sufficiently extensive observations have been made as to the effect of disease upon milk yield.

The present observations were carried out in two tuberculosis-free herds (149 and 203 cows respectively), most of them being of the Ayrshire or Friesian breed. Bacteriological examinations of the milk for mastitis and serological examinations of the blood for abortus infection were made periodically with each animal, and the cows were then sorted into four categories by one author (F. C. M.), who at the time was unaware of the milk records. The categories were:—

M− A− Cows free from both mastitis and abortion.

M+ A− Cows not reacting to the abortion test but infected with mastitis.

M− A+ Cows free from mastitis but reactors to the test for abortion.

M+ A+ Cows affected with mastitis and reacting to the abortion test.

Cows of doubtful category were excluded.

The yields from 180 lactations in 139 Ayrshires and from 193 lactations in 138 Friesians were examined statistically, the records being standardised by Sanders' method. When all the lactations of all cows were considered, the average reduction in yield per lactation was 954 lb. due to mastitis and 1,685 lb. due to mastitis and abortion combined. In all these cases the defect in yield was of statistical significance. Sanders, however, was not concerned with disease, and his method is therefore less suitable for this class of work than one based on the milk yield of cows known to be free from the common contagious diseases of cattle. When this more suitable method is used, differences in yield between healthy and diseased cows, insignificant by Sanders' method, become more prominent or attain significance.

In terms of percentage fall in yield by comparison with that for healthy cows, the results may be expressed as follows. Among the Ayrshires mastitis reduced the corrected yield on an average by 10·8 per cent.; among the Friesians the percentage loss was higher, averaging 16·5 and 19·5 respectively in the two herds. Among the Friesians forming one herd the percentage reduction in corrected yield due to *Br. abortus* infection averaged 20·7, *in spite of the fact that these animals did not abort.* The reduction in yield was thus much more serious among Friesians than among Ayrshires, and this was not an age effect.

It is considered that the results obtained in this work should be extended when a suitable standard applicable to the different breeds has been formulated. As they stand, however, the results are of interest from the economic point of view. If a loss of milk, found by Sanders' method to amount on an average to 89 gallons per lactation in the Ayrshire breed and to 160 gallons in Friesians (approximate figures), may be expected to accompany streptococcus mastitis in its subclinical form, the aggregate loss to the dairying industry from this cause alone must be tremendous. And this, of course, is not the only factor to be considered. Allowance has to be made for the excessive herd wastage and the depreciation in market value of affected animals, and, finally, there is the effect of the disease upon milk quality. The results presented also go to show that the increased cost of milk production caused through mastitis is raised still further by infection with contagious abortion, even though the cow does not actually abort.

[**The Influence of Tuberculosis upon the Development of Brucella abortus Infection.** Pullinger, E. J. (1936.) *J. Hyg.* **36.** 456-466. (6 tables, 11 refs.)]

Whilst investigating the incidence of the contamination of market milk with *Brucella abortus*, it was found that 70 out of 101 samples of milk from Certified or Grade "A" (T.T.) herds, but only 59 out of 209 samples from ungraded herds, contained this contaminant. At first sight this would suggest that contagious abortion is more prevalent in graded than in ordinary herds. It is extremely unlikely, however, that such a difference could be real, and in fact one would expect to find the higher incidence amongst ordinary herds. Clearly some unknown factor exists which sometimes hinders the isolation of *Br. abortus* from milk by guinea-pig inoculation.

In an attempt to explain the misleading figures revealed by the aforementioned survey, various possibilities were tested. It was conceivable that the high saprophytic bacterial content of ordinary milk, or its consequent high acidity, destroyed the Brucella *in vitro*. Also it was possible that, as a result of inoculating a mixture of *Br. abortus* into guinea-pigs together with countless other organisms, the former organisms might be destroyed by the cellular reaction induced by the inoculation of the saprophytic contaminants.

These alternative hypotheses were tested by using milk of varying degrees of cleanliness artificially contaminated with known amounts of *Br. abortus*. It was concluded that the failure to isolate this organism could not be explained by the concomitant presence of large numbers of saprophytes. Nor was it likely that the degree of acidity achieved in milk, still fit for sale, could play any part in the destruction of *Brucella*.

Since many samples of ordinary milk are contaminated with tubercle bacilli, the possibility that the combined inoculation of these organisms and of *Br. abortus* might inhibit the development of the latter infection was investigated. For instance, in one experiment, when 30 guinea-pigs were inoculated with a mixture of the two organisms, they all developed tuberculosis, but none developed *Br. abortus*, while 30 control animals receiving similar doses of *Br. abortus* alone all developed this infection. Similar results were obtained in confirmatory experiments.

It is suggested that the strong mononuclear cellular reaction stimulated by the presence of tubercle bacilli destroys the *Br. abortus*, particularly if the *Br. abortus* bacilli are present in small numbers or are of low virulence. By inoculating the two organisms into opposite sides of guinea-pigs instead of into the same site a certain degree of inhibition could still be demonstrated. This suggests that the cellular reaction is to some extent generalised, and is not confined to the site of inoculation.

The interference with the development of Brucella infection brought about by tubercle bacilli lessens the value of guinea-pig inoculation for identifying contamination of milk with *Br. abortus*. It is also suggested that other unidentified organisms may sometimes occur in raw milk, which have an inhibitory action similar to that of tubercle bacilli.

E. J. P.

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[**Studies on the Bactericidal Action of Bovine Whole Blood and Serum towards Brucella abortus and Brucella suis.** Irwin, M. R., Beach, B. A., and Bell, F. N. (1936.) *J. Infect. Dis.* **58.** 1. 15-22.]

This work was undertaken to determine whether the bactericidal action of the whole blood and serum afforded an indication of the susceptibility of cattle to experimental infection with *Brucella abortus*. The experimental animals were divided into two groups, the first consisting of 14 "recovered" animals (experimentally infected animals, but at the time of these experiments showing no agglutinins or only to low titre, and the organism being absent from the milk). The other group consisted of 23 non-infected females. The same strain of *Brucella abortus* was used throughout.

The animals were graded "high," "intermediate" and "low," according to the bactericidal power of their blood. This bactericidal power was found to be a property of the plasma, not of the cells. Individual animals showed a uniform reaction on successive tests. No marked destructive activity was found for *Brucella suis*. Some "recovered" animals showed a loss of bactericidal power of their whole blood as compared with normal animals.

According to the author, the results following experimental infection suggest that by this technique it is possible to pick out the resistant and the susceptible cattle in a herd.

D. L. H.

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[**A Note on the Toxicity of Nicotine Sulphate for Lambs.** Rose, A. L. (1936.) *Austral. Vet. J.* **12.** 2. pp. 64-65.]

The author reports harmful results following careless dosage of lambs with the nicotine sulphate and copper sulphate treatment for parasitic gastro-enteritis after a 24 hours' period of starvation, the dose used being about twice that recommended.

Losses among 500 five- to six-months-old lambs amounted to 8·4 per cent. The first deaths occurred two to three hours after dosage, lambs dying later the same day being bloated.

No diarrhoea was seen until the second day, although some lambs showed straining. An intense haemorrhagic gastro-enteritis involving the abomasum and first 25 feet of small intestines was a constant *post-mortem* finding.

Treatment by giving half-a-pint of milk appeared to be effective. C. V. W.

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[Fatal Effect of Heavy Infestation with Cooperia curticei (Railliet, 1893) in Goats. Edgar, G. (1936.) *Austral. Vet. J.* **12.** 2. 58-61. (4 refs.)]

The author describes a parasitic outbreak in Saanen goats of all ages and both sexes imported to heavily-stocked, rich pastures around Sydney. The animals were affected with diarrhoea, which persisted until they succumbed. The fatal results were apparently due to a pure intestinal infestation with *Cooperia curticei*. In one case which was subjected to a *post-mortem* examination, the contents and scrapings from the first 35 feet of the small intestines yielded 30,000 parasites. The abomasum contained only 200 specimens of *Ostertagia circumcincta*. Treatment with tetrachlorethylene gave very poor results.

The author thinks there is sufficient justification for concluding that a heavy infestation with *C. curticei* is of pathogenic significance.

C. V. W.

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[Some Considerations Concerning the Resistance of the Vertebrate Host Against Helminth Parasites.* Cameron, T. W. M.]

Owing to the facts that the "helminth" parasites are very complicated organisms belonging to several phyla, that their physiological processes within the host are absolutely unknown, and that none can complete its life-cycle within a single host, it is impossible to apply the usual bacteriological concept of "immunity" to the reactions of the host to their presence. The term *resistance* is suggested as a more satisfactory expression of what actually takes place. This resistance may be passive or active, absolute or partial, natural or induced, or a combination of these alternatives. Passive resistance is incompatibility and refers to the lack of environmental factors necessary for the normal metabolism of the worms; active resistance implies a host reaction, humoral or otherwise, against the parasite. Absolute resistance means that the worm cannot reproduce successfully, while partial resistance permits of successful reproduction, but the worm is otherwise interfered with in size, duration of life and so on; both of these may be active or passive also.

Natural resistance is resistance shown in the complete absence of previous infection; it may be active or passive, absolute or partial. Absolute resistance is most frequently shown against parasites of unrelated, and partial resistance against parasites of more closely related, groups of animals. Induced resistance is the result of previous infection and must be active, but may also be absolute or partial.

Present evidence suggests that the most important form of resistance is passive, and that worms fail to become or remain established mainly because of lack of essential environmental factors. When active resistance is shown, there is no reason to suppose that there are any essential differences in the underlying mechanism from that shown against any other foreign irritant. The main defence reactions appear to be connective tissue hyperplasia to isolate the parasite and/or repair the damage, eosinophile accumulation and production to act against "foreign proteins," and the production of "foreign-protein" antibodies with the accompanying phenomena of hypersensitiveness. There is evidence that all of these phenomena may be affected by diet.

The fibrous tissue reaction has been little studied, and there is an urgent need for more intensive research in comparative pathology, *e.g.*, the comparison of the reactions of a variety of hosts to a common stimulant. There is an equally urgent need for biochemical and physiological research on the parasites themselves. Until much more work is done on these lines, theories must be hypothetical and data unsatisfactory.

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[Coccidia in Relation to Domesticated Animals.* Tyzzer, E. E.]

In any study of coccidiosis, the importance of determining accurately the species concerned may hardly be over-emphasised. The briefest survey of the literature reveals the confusion wrought by failure to differentiate species. Too often descriptions are based on minor morphological features of the oöcyst or else too great weight is given to its measurements. Much of this confusion and inaccuracy is wholly needless. The sporulation time may often be readily determined; the exact habitat of the coccidium may be revealed by sample scrapings from various parts; and if suitable experimental animals are available, the developmental period may be determined. Stained sections may be required for the study of developmental stages and of host-cell reactions. If the infection is possibly a mixed one, isolation of species becomes necessary, either by means of single oöcyst infections or by other procedures.

In coccidiosis studies, there should be borne in mind Boughton's demonstration of rhythm

*Abstracts of communications made to the Second International Congress for Microbiology, London, July 25th-August 1st, 1936.

in oöcyst production, reflecting the influence of the host physiology. In the study of coccidiosis, it becomes apparent that it is often difficult to reduplicate experimentally manifestations of disease that develop under natural conditions. Different types of infection are recognised, one of which, in the absence of reinfection, is self-limited, and runs a brief course, but is not terminated by any protective reaction on the part of the host. It is possible to reinfect repeatedly the latter, although eventually protective reactions may prevent further reinfection. It is notable, however, that species which regularly produce self-limited infection occasionally, in the absence of reinfection, continue to multiply until the host is overwhelmed. The conditions which bring about this chronic, progressive type of infection have not been determined. Another type of coccidiosis is one in which the organism is maintained at only slightly varying levels indefinitely, in some cases throughout the life of the host, but without obviously harmful effects. The differences in these types of infection reside primarily in the maintenance of the coccidium population within the host. In case the tendency to gametic differentiation is pronounced, the decrease in asexual forms results in a diminishing parasite population, and hence a self-limited infection. If, on the other hand, there is even a slight increase in asexual forms in successive generations, the infection becomes progressive. In infection in which the organisms are maintained at more nearly constant levels for indefinite periods, it is necessary to assume a very delicate balance in regard to reproduction.

Underlying the differences in the pathogenic effects of various species of coccidia are, first, the qualitative factors illustrated in the various types of injury produced, and second, the quantitative factors residing in the ability of the parasite to continue its increase. Profound injury may result in severe, acute disease, while continued multiplication furnishes an even more serious, chronic and progressive disease.

In the absence of humoral reactions, something may be learned of immunity through the study of tissue-reactions of immunised hosts to infective forms in stained sections. For example, in immunised chickens, the sporozoites invade the epithelial cells but the failure of the latter to respond favourably results in the prompt degeneration and disappearance of these forms. It is possible, although not demonstrated, that development may be arrested at other stages. That a great proportion of the sporozoites may be lost in consequence of lodging in cells other than those of the epithelium is of interest. Thus the "actual" dosage, *i.e.*, the number of infective forms reaching their normal destination, may by no means conform with the "intended" dosage, *i.e.*, the number inoculated.

Reports

CITY OF MANCHESTER

SUMMARY OF THE ANNUAL REPORT OF THE MARKETS COMMITTEE FOR THE YEAR ENDED MARCH 31st, 1936.

This report of the General Superintendent includes the meat inspection and other work carried out by the Chief Veterinary Officer and his three assistants.

The numbers of cattle, sheep and lambs, calves, and pigs killed in the City Abattoirs were 77,239, 411,464, 10,628, and 14,216 respectively. These figures show an increase of about 10,000 in the number of cattle over the previous year, while the numbers of sheep and lambs, calves, and pigs remain approximately the same. This is encouraging from the beef producers' point of view. The number of carcases of beef exposed for sale in the wholesale meat market and killed elsewhere in the British Isles was 5,879, as compared with 9,745 in 1934; the figures for other animals killed elsewhere in the British Isles being: sheep 13,959, calves 21,520, and pigs 37,595. The number of carcases of pigs exposed for sale shows a considerable increase over previous years. It is to be noted that the number of pigs killed outside the City and exposed for sale in the City Meat Market was almost two-and-a-half times the number killed in the City Abattoirs.

In all, 1,288 carcases were condemned at the City Abattoirs as unfit for food, comprising beef 690, mutton and lamb 504, veal 32, and pork 62. The figures for dressed carcases consigned to Manchester from elsewhere in the British Isles were:—beef 899, mutton and lamb 175, veal 296, pork 409, or roughly one in every $6\frac{1}{2}$ carcases of beef and one in every 80 carcases of mutton. No fewer than 960 carcases of beef, or 60 per cent. of the total number of carcases condemned, were condemned on account of tuberculosis.

The numbers of animals exposed for sale at the City livestock market were:—cattle 63,199, sheep and lambs 231,566, calves 151, and pigs 830, a decrease of 59,000 as regards sheep and lambs. This is to some extent accounted for by the fact that on four market days business was practically at a standstill owing to outbreaks of foot-and-mouth disease in neighbouring areas.

Diseases of Animals Acts

During the year there were no outbreaks of anthrax, foot-and-mouth disease, or sheep scab, but on two occasions Manchester has been within a foot-and-mouth disease infected area.

Parasitic Mange.—There were two outbreaks of this disease, affecting three animals, all making an uneventful recovery.

Tuberculosis Order, 1925.—Eight cases were taken under this Order, but unfortunately no indication is given of the numbers of cows in the City boundary, so no comparison is possible.

Swine Fever Order.—Three outbreaks of this disease were confirmed, and 47 "in contact" swine were destroyed. One prosecution was taken under the Lancashire and District Swine Fever Infected Area Order of 1934.

Transit of Animals Orders.—Three hundred and ninety-eight visits were paid in all to railway sidings, etc., and 7,945 licences were granted by Inspectors under the various orders.

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BENGAL

REPORTS OF THE CIVIL VETERINARY DEPARTMENT AND OF THE VETERINARY COLLEGE FOR THE YEAR 1934-35*

The staff of the Department consisted of one Director (Mr. P. J. Kerr), two Assistant Directors, nine Veterinary Inspectors and 129 Veterinary Assistant Surgeons. A Veterinary Investigation Officer (Mr. M. B. Menon) was also employed for special work. It is stated that the activities of the officers were unduly restricted for financial reasons.

There was an increase in cattle disease, more particularly from rinderpest and anthrax. It is reported that haematuria in cattle is responsible for considerable losses in hill districts.

Preventive inoculation was largely practised. A notable feature is the extensive use of goat tissue vaccine for rinderpest. It has replaced serum in a large measure and is reported to be effective and economical. The Veterinary Investigation Officer was responsible for the manufacture which has now been reduced to routine. This officer's work in the investigation of disease is commended in the report. A full account of his activities has been forwarded to the Imperial Council of Agricultural Research.

The work of the subordinate staff in the districts and at the 55 veterinary hospitals denotes progress. Propaganda work is in the charge of a special officer whose services are in great request.

Bengal Veterinary College

The staff consisted of the Principal (Capt. A. D. MacGregor), eight lecturers including the Vice-Principal, and 14 qualified subordinates. The institution continues to be popular and there is an increase in the admissions of Bengal students. Many students come from other parts of India and some from abroad. The College appears to be well equipped and the number of patients treated in the hospital should provide good experience for the students, the daily average for the year being 123.

*High Commissioner for India, India House, Aldwych, W.C.2. Price 6d.

N.V.M.A. Divisional Report

ROYAL COUNTIES V.M.A.

SUMMER MEETING AT CAMBRIDGE*

The Summer meeting of the Royal Counties Veterinary Medical Association was held at the Institute of Animal Pathology, Milton Road, Cambridge, by kind invitation of the Director, Professor J. B. Buxton. Nine years have elapsed since the Association last visited Cambridge, and it was somewhat unfortunate that the weather was showery on this occasion.

Business Meeting

The proceedings opened with a short business meeting, with the President, Major J. J. Dunlop, in the chair.

The following members attended :—Mr. J. R. Baxter, Capt. R. E. C. Bullen, Prof. J. B. Buxton, Mr. P. Crosfield, Major G. W. Dunkin, Major J. J. Dunlop, Sir F. Hobday, Capt. W. L. Little, Mr. J. W. McIntosh, Capt. E. Brayley Reynolds, Lt.-Col. P. J. Simpson, Capt. W. K. Townson, Mr. F. W. Willett, and Mr. H. Bell (Hon. Secretary).

The Minutes of the previous meeting, having been published in the *Veterinary Record*, were taken as read.

The following members apologised for inability to attend :—Mr. J. Bell, Capt. J. C. Coleman, Capt. Collett, Capt. J. R. Craft, Major A. C. Duncan, Mr. Gooch, Lt.-Col. H. Greenfield, Capt. J. R. Hewer, Mr. G. E. King, Major H. G. Lepper, T. Lepper, Vety. Lt-Col. G. B. C. Rees-Mogg, Lt.-Col. P. W. Dayer-Smith, and Major F. J. Taylor.

Correspondence.—The Hon. Secretary read a letter from Mrs. Tennant returning thanks for a letter of condolence which had been sent to her at the time of Major Tennant's death.

Place of Next Meeting.—It was decided that the November meeting be held in London. Sir Frederick Hobday said that as the meeting was to be held in London he would be very pleased to see them at the Royal Veterinary College. The President thanked Sir Frederick and it was decided to hold the November meeting at the Royal Veterinary College.

It was unanimously agreed that a donation of £1 1s. 0d. be sent to the Victoria Veterinary

*Received for publication September 26th, 1936.

The activities of the Raymond Research Laboratory, and the Department of Epizootic Diseases of Animals in Calcutta, are duly recorded. They form an interesting part of the report and it is clear that they fully maintain their usefulness.

G. K. W.

Benevolent Fund in memory of Professor James MacQueen.

Any Other Business.—The PRESIDENT intimated that although he (or his nominee) was elected to attend the Royal Sanitary Institute's Congress, the Association had not been represented this year. He had found himself unable to attend and his nominee had also found it impossible to do so, therefore he (the President) had decided to omit representation for this year.

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At the close of the meeting, Professor BUXTON welcomed the members to Cambridge and gave a brief outline of the programme which had been prepared for their benefit. The members then divided themselves into groups and made a tour of the laboratories where they found plenty to interest them in the work which is being carried on in the Institute. The programme of demonstrations was as follows :—

Mr. F. BLAKEMORE.—Laryngo-tracheitis, fowl paralysis, tuberculosis and various other diseases. The examination of milk (mastitis), and *post-mortem* specimens of current interest.

Mr. C. W. B. WRIGHT.—Poisonous plants.

Dr. J. R. M. INNES.—The morbid anatomy and history of "swayback" in lambs and analogous conditions.

Col. W. A. WOOD and Mr. D. G. DAVEY.—Parasites.

Dr. J. A. NICHOLSON.—Physiological effects of *B. welchii* toxins and the effect of manganese on the magnesium content of the blood.

Dr. J. STEWART.—Deficiency diseases.

The party later repaired to Professor Buxton's house where the members and their friends were entertained to tea. Professor and Mrs. Buxton had spared no pains to ensure the comfort of their guests. Not only had a spacious marquee been erected, but that on the Professor's tennis lawn. After the party had partaken of tea the PRESIDENT, Major J. J. Dunlop, in a short speech tendered the very best thanks of the Association to everybody who had contributed to make the afternoon such an enjoyable one : to Professor and Mrs. Buxton for their generous hospitality and to the Professor and every member of his staff at the Institute for the trouble which had been taken to provide such an interesting and instructive programme.

Major Dunlop expressed regret that more ladies were not present, and suggested that the somewhat uncertain weather conditions had probably kept some of the fair sex away. It appeared to Major Dunlop that the difficulty of finding suitable meeting places for these summer outings was rather more imaginary than real. Meeting places which would provide something both instructive to the members and attractive to the ladies were supposed to be hard to find, but he thought that the afternoon which they had spent at Cambridge afforded everything which could have been desired.

This vote of thanks was carried with acclamation.

Professor BUXTON, in his reply, said how pleased he and Mrs. Buxton were to see such a fine attendance, the more so because so many of those present had come long distances.

The Professor went on to say that it was a long time since they had had the pleasure of entertaining the "Royal Counties" at Cambridge. They were always very glad indeed to have the pleasure of entertaining Divisions of the "National." It might be that they did not see enough of the Divisions. Surely it must be of mutual benefit for those who were engaged in research to meet those who were at work in the field.

The Professor said that by visiting the Institute that afternoon and displaying the interest which they had shown in the work going on, the members had honoured every member of the staff at the Institute and in so doing they had honoured him whose privilege it was to direct the work which was carried out at the Institute. He thanked the visitors for their attendance and assured them that it had been a pleasure to have the opportunity of entertaining them.

It is regretted that the list of ladies who graced the occasion is incomplete, but amongst those present were Mrs. Dunlop, Mrs. Buxton, Mrs. Willett and friend, and Miss Baxter.

H. BELL, *Hon. Secretary.*

THE POISONS LAW

The Home Office desires to draw the attention of doctors, dentists and veterinary surgeons, to the publication of an explanatory memorandum which has been issued for their assistance in ascertaining the requirements of the Poisons Law affecting them.

The Memorandum, which also deals with the control of poisons in hospitals, dispensaries and similar institutions, is entitled, "Poisons No. 3 (Practitioners and Hospitals)" and can be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingway, London, W.C.2; 26, York Street, Manchester, 1; 120, George Street, Edinburgh, 2; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller, price 3d. net or post free 4d.

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The Coventry Council has approved publication of a notice that after the expiration of six months, slaughtering in private slaughterhouses (except in one instance where a moratorium exists) is to cease. It was also decided to prohibit the hawking of meat except in special cases.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 17th.—Meeting of the Executive Committee of the Scottish Branch, N.V.M.A., 12 noon; meeting of the Scottish Branch, 2.30 p.m.—both at the Station Hotel, Dumfries.

Oct. 19th.—Special Meeting of R.C.V.S. Council.

Oct. 21st.—Meeting of the Western Counties Division, N.V.M.A., at Taunton, 2 p.m.

Oct. 26th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, 4 p.m.

Oct. 29th.—Meeting of the Derbyshire Division, N.V.M.A., at Sutton Bonington, 2.30 p.m.

Oct. 30th.—Meeting of the Yorkshire Division, N.V.M.A., at Leeds.

Nov. 5th.—Annual Dinner of the Central Veterinary Society, Mayfair Hotel, W.1.

Nov. 26th.—R.C.V.S. Examination fees due.

Nov. 30th.—All changes of addresses to be sent to the Registrar, R.C.V.S., for inclusion in 1937 Register.

Dec. 3rd.—R.C.V.S. Written Examinations.

Dec. 7th.—R.C.V.S. Oral Examinations commence in Dublin.

1937

Jan. 8th.—R.C.V.S. Council Meetings.

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R.C.V.S. OBITUARY

The Late Mr. Titus Littler, M.R.C.V.S.

The death of Mr. Titus Littler, which we recorded with much regret in our last issue, removes one who was for many years a well-known figure in the hunting world, and came as a great shock to the community at Long Clawson, of which he was a highly respected member. The widest sympathy is expressed with Mrs. Littler and her five sons.

Deceased was a son of the late Mr. and Mrs. Robert Littler, of Long Clawson, and on his father's death he succeeded him in his practice as veterinary surgeon. It is interesting to note that four of Mr. Littler's five sons are also members of the Royal College of Veterinary Surgeons.

"For the past few years he had spent much time at Elgin Lodge, Melton Mowbray, until he made a new home at Hickling, which he named 'The Retreat,' states the Grantham *Journal*. "Here he died at the age of 81.

"Though living at Hickling he would often visit Long Clawson to spend a week-end at his old home, and on the Thursday before he passed away he stayed with his son, Mr. J. Rushland Littler, who now lives there.

"Mr. Littler's practice had gained for him recognition over a wide area, and a post he had often filled during his 60 years' official connection with the district was that of honorary veterinary surgeon to the Belvoir Hunt Point-to-Point races, which are held at Long Clawson."

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The Late Mr. Joseph Urmson, M.R.C.V.S.

By the death of Mr. Joseph Urmson, M.R.C.V.S., which, as we reported with great regret in our last issue, occurred at his home, 5, Chorley New Road, early on October 4th (his 71st birthday), Bolton loses its oldest veterinary surgeon.

"Born at Little Hulton, where the family connection with St. Paul's, Peel, dated back to the time when the parish was a district chapelry in the parish of Deans," states the *Bolton Evening News*," Mr. Urmson was educated at Farnworth Grammar School, and graduated at the Edinburgh College. He was not allowed to practise for twelve months after receiving his diploma owing to his youth, but after a short period with Mr. W. H. Bridge, who afterwards became veterinary inspector to the Corporation, he commenced to practise in Great Moor Street. He remained there for 31 years and then, after a short period in Shiffnall Street, opened the present forge, stables and surgery at Johnson Street, about 15 years ago. He completed 50 years in practice in the town last April, and for a similar period had the firm of Messrs. Jos. Nall and Co., Ltd., carriers, as one of his clients.

"A staunch Conservative and a former member of the Rotary Club and of Holy Trinity Church, Mr. Urmson was a life member of the Royal Lancashire Agricultural Society, and in the capacity of honorary veterinary surgeon, had attended its shows all over the country for many years. He was a past master of the Georgian Lodge of Freemasons and an old member of St. George's Lodge and the Royal Arch Chapter.

"Mr. Urmson had been twice married, his first wife (formerly Miss S. E. Charlton, of Little Hulton), predeceasing him in 1918. Mrs. Urmson whom he married in 1920, was formerly Mrs. M. Macklin, of Ashton-under-Lyne, where she has been a member of the County Bench for 16 years. There are six daughters and a son.

"Mr. Urmson had been in ill-health for the past 13 months. He had an extensive knowledge of and love for horses and could remember the distinctive features of animals he had not seen for years when they passed through his hands again."

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FOOT-AND-MOUTH DISEASE IN OXFORDSHIRE

The existence of foot-and-mouth disease was confirmed on Sunday among cattle at Upper Heyford, Oxford. The area subject to restrictions in the movement of animals lies in the counties of Oxford, Northampton, Buckingham, Berkshire and Warwick.

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LEGAL NOTES

Anthrax Order Offences.—At Preston Police Court, on October 5th, Thomas Whalley, of Green Edge Farm, Whittingham, was fined £2 for failing to notify the local authority of a diseased pig, suspected of being affected with anthrax, and £1 for aiding and abetting the cutting of a diseased pig, suspected of being affected with anthrax; he was also ordered to pay £3 5s. witnesses' expenses. Richard Rowe, of Bottoms Farm, was fined £3 for cutting the carcase of a diseased pig suspected of being affected with anthrax. The offences were admitted.

John T. Procter, pork butcher, of Great Harwood, said he visited Whalley's farm on September 6th. Whalley told him he had slaughtered a pig and said: "You can take that

pig and have it inspected, and then do the best you can with it." The pig was delivered at his premises the next morning and his employee, William Standing, took it to the Blackburn Abbatoirs for inspection.

Captain E. J. Burndred, M.R.C.V.S., D.V.H., veterinary officer, Blackburn Corporation, stated that when he examined the pig he found evidence of acute septicaemia. He told Standing he would have to have the carcase for a blood test. Witness found anthrax bacilli in the blood, and informed the Great Harwood police. He also sent material from the carcase to the Ministry of Agriculture, who confirmed that there was anthrax in the material. Whalley ought to have seen the carcase was not normal. "It is a very deadly disease, communicable to humans, and there are cases time after time," observed witness. "I have personally had experience of butchers who have contracted the disease from carcases affected by anthrax."

P.-s. Kearsley stated that he had interviewed the two defendants on September 7th and both said the pig did not appear to be suffering from anthrax when it was slaughtered. He learned that Rowe had killed the pig.

Captain J. W. Wilson, M.R.C.V.S., Ministry of Agriculture veterinary inspector, said he disinfected Whalley's stye where the pig had been kept, the place where it had been killed and the implements used, when he visited the farm on September 9th.

Mr. G. Hodgson, representing Whalley, stated that there had been no attempt to foist food on the public that was not fit for human consumption. The pig was suffering from inflammation of the bowels when Whalley had it killed, and he arranged for it to be examined.

"He has done everything the wrong way round," remarked Mr. Hodgson. "By arrangement with Mr. Proctor, he took the pig to an inspector, whereas if he had asked a policeman, who knows nothing about it, he would have committed no offence."

Rowe also pleaded guilty. He stated that he had killed thousands of pigs. The pig showed no signs of serious illness, otherwise he would not have touched it.

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Failure to Notify Tuberculosis.—At Brighouse Borough Court, a fine of £30 was imposed on James Edward Crabtree, farmer, of Back Brade Farm, Rastrick, and of Boothroyd Farm, Rastrick, for failing to notify the authorities of tuberculosis in cattle; and Harold Appleyard, cattle dealer, of 180, Booth Town Road, Halifax, was fined £15 for a similar offence. Both defendants had to pay £1 17s. 6d. costs.

Prosecuting, Mr. C. Phythian said that the summonses were taken out under the Tuberculosis Order, of 1925, made in pursuance of the Diseases of Animals Act, 1894, and a maximum fine of £50 could be made for contravention. On July 2nd, Sergt. Griffiths, of the Halifax Borough Police, and Mr. J. Flanagan, assistant to the veterinary surgeon of Halifax County Borough, were in Lee Lane, Halifax, when they noticed a number of cows being driven into a field by the Sportsman Inn. One of the cows was in a terrible state and could not walk far without stopping. It was quite obvious to those two, that the cow was in the last stages of tuberculosis. It was very thin and its bones could be seen through the skin. Sergt. Griffiths found the owner of the cow was the defendant Appleyard, who said that he had not notified the authorities or reported the matter to the police. Appleyard said he had bought the cows from Crabtree on June 30th, and Crabtree must have known when he had the cow at Rastrick that it must have been suffering from tuberculosis. Crabtree had described the cow in his register as wrong, but it must have been perfectly obvious to him that the cow had tuberculosis, but he gave no notification whatever, to the authorities. On July 3rd, the cow was slaughtered, and the *post-mortem* examination revealed tuberculosis throughout the whole of its system.

Evidence was given by Sergt. W. Griffiths, Mr. J. Flanagan, M.R.C.V.S., and Mr. J. Pollard, M.R.C.V.S., D.V.S.M., veterinary surgeon to the Halifax County Borough, who carried out the *post-mortem* examination, and who said it was obvious to anyone who knew anything about cows that it was suffering from tuberculosis.

Crabtree said he thought that the indisposition of the cow was due to the presence of wire internally. He had never heard it cough. Had the animal shown signs of tuberculosis he certainly would have reported it to the authorities, and by doing so would have received compensation and been better off financially.

Appleyard had nothing to say.

In announcing the fine, the Chairman of the Bench said the case was a very serious one, as the cow might have contaminated the whole herd.

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Swine Fever: Owner's "Serious Mistake" in Source of Advice.—When Robert Bell, farmer, Aigle Gill, Aspatria, was summoned at the Wigton Police Court for contravening the Swine Fever Order, of 1908, by failing to notify that he had in his possession pigs affected with or suspected of swine fever, Police Superintendent Graham said outbreaks of swine fever in other parts of the county led to the defendant's farm being visited and the existence of swine fever discovered. Defendant stated that Mr. Mann, of Wigton, had treated the pigs for pneumonia, which had developed from influenza.

Sergeant Reay stated that on August 13th he accompanied Captain T. W. Woodhead, M.R.C.V.S., the Ministry's Officer, of Carlisle, to Aigle Gill farm. Captain Woodhead explained the reasons why they were there, and they were shown 73 pigs. One was dead and seven more were visibly affected. Asked when the pigs first started ailing, Mr. Bell replied: "About a fortnight ago. They were all right for a fortnight after they came, then some of them refused their food and started coughing." Mr. Bell said that "a few had died. I think about eight or nine; certainly not more than ten."

Defendant also stated that the pigs were part of a consignment of 49 which he bought from a dealer in Carlisle on July 9th, and that he had Mr. Mann from Wigton, who examined the pigs and said they had been suffering from influenza which had developed into pneumonia, and he had treated them accordingly.

Captain Woodhead held a *post-mortem* on the dead pig, also on two more which had died and been buried. Part of the intestines were sent to the Ministry of Agriculture, and it was certified on the 15th that swine fever had existed.

Cross-examined, witness said that defendant was asked if he had any suspicion that it was swine fever, and he replied that he had no suspicion.

Captain Woodhead said that as a result of swine fever on a farm at Stainton, near Carlisle, in August, he visited the premises of the defendant, accompanied by Sergeant Reay, whose evidence he corroborated. The outbreak at Stainton was in pigs that had been bought in Carlisle market from the defendant, two dying afterwards.

Witness, in reply to Superintendent Graham,

said that there were fourteen certified cases of swine fever in the county up to date and other cases awaiting confirmation. "The position is very serious," he added.

Mr. Lightfoot, on behalf of the defendant (who pleaded "guilty," subject to an explanation) said that last November some of Mr. Bell's pigs got into a rather peculiar condition, and he consulted a veterinary surgeon, who reported that there was a suspicion of swine fever, the Ministry, however, later notifying that it was not swine fever, so that the restrictions were removed. Last July the defendant's pigs again got in a suspicious state, and, so far as he could see, the symptoms were the same as last November; had he had any suspicion that there was swine fever present he would certainly have reported to the police. In July he did not employ a registered veterinary surgeon; he was relying on what had happened in November, and came to the conclusion that it was the same sort of thing. Mr. Bell was a good farmer, and would not do anything that would help in the spread of the disease.

The Chairman said the same veterinary surgeon was still in the district.

The Chairman giving the decision of the Bench, said that the magistrates all agreed that Mr. Bell made a very serious mistake, in a case of that kind, in bringing in an unqualified man. Had he employed a qualified veterinary surgeon it would have cleared him absolutely—the veterinary surgeon would have given his opinion and would have brought in an inspector. In serious cases of that kind, which the Ministry of Agriculture had to deal with, it was dangerous for farmers to bring in an unqualified person.

The Bench had taken what they considered a lenient view and Mr. Bell would be fined £10 and £1 10s. 9d. costs.

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PERSONAL

Birth.—Brekke. On Saturday, October 10th, at Malton Cottage Hospital, to Elizabeth, wife of Major H. W. Brekke, M.R.C.V.S., a daughter.

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A Post-Congress Casualty.—Members who, at Congress, saw Mr. R. C. Locke, of Manchester, in such active trim with his camera, will be particularly sorry to learn that almost immediately afterwards, he sustained a serious leg injury at the sterner pursuit of "Association" football. Mr. Locke, who has been recognised for some time as one of the most skilful amateur exponents of the game in the North-West, is now able to get to the "Public Health Department" by means of a stick, and is hopeful that he will remain in the game. It may well be, however, that Mrs. Locke has other views!

. . . . .

On Leave.—Mr. H. Hay-Barclay, M.R.C.V.S., Veterinary Officer, Agricultural Department, Kenya, and Mr. W. C. L. Orr, B.Sc., M.R.C.V.S., Veterinary Officer, Gold Coast, arrived in this country during the month of September, on leave.

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1936 CONGRESS NUMBER

We are grateful to the many members who have written to express their appreciation of the above specially enlarged and illustrated number of the *Veterinary Record*, published on October 10th. As was perhaps inevitable, however, in producing an issue of such dimensions within the shortest time possible, one or two "slips" occurred. We regret that the name of Mr. R. Swaby, of Gainsborough, who definitely "signed the book," was omitted from the list of attenders, that the name of Mrs. R. C. Locke, of Manchester, was inserted in error, in place of that of Mrs. H. V. Locke, who was present as a visitor, and that, in our report of the Congress banquet, Mr. E. F. McCleery, Secretary of the Local Committee, was described as its Chairman—a position held, of course, by Mr. J. O. Powley.

Mention should also be made of the fact that, excepting the one cryptorchid casualty, all the animals that were the subjects of operation at Scarborough, and which remained under the post-operative care of Mr. H. W. Good, M.R.C.V.S., have made uninterrupted progress.

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ARMY VETERINARY SERVICE

London Gazette—War Office—Regular Army

Oct. 13th.—Maj. C. S. Northcott retires on ret. pay on account of ill-health (Sept. 11th); Lt. G. D. Young, from T.A. Res. of Off. (101st Q.O.R. Glasgow Yeo. Fd. Bde., R.A.), to be Lt. (on prob.) (Sept. 9th) (Substituted for notification in the Gazette of Sept. 15th).

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NATIONAL PONY SOCIETY

The 1937 *Show.*—Mr. Herbert Bright, the President of the National Pony Society, announced at the recently held Council meeting that the next Pony Show at the Royal Agricultural Hall, London, would take place on Friday and Saturday, March 12th and 13th, 1937.

The schedule of classes for the show was drafted and a number of additions made. In connection with these, it was stated that due to the great success attendant upon the introduction of classes for the mountain and moorland ponies to be ridden, there would be four classes at the next show, *viz.*, class for Dales and Fell ponies, class for Highland ponies, one for Dartmoor and Welsh ponies, and one for Exmoor and New Forest ponies. The *Country Life* Cup would be offered to the best pony in the four classes, and four miniature cups would be given for the best pony in each class to be ridden by a child. The *Country Life* were also presenting certificates in these classes. In addition, there would be two classes for Welsh ponies, six classes for Shetland ponies (including two for miniature Shetlands), three children's riding classes, two equitation tests for children, and competitions and jumping classes on each afternoon. The Arab Horse Society would again provide a range of nine classes for Arab horses. Owing to the ever-increasing number of entries received for the children's riding pony classes it had been found impossible to continue the custom of accepting entries up to the night before the show, and, therefore, at the 1937 show, entries for the children's classes would have to be made a fortnight before the show, *viz.*, close of entries on March 1st. Mr. R. C. Irving, F.R.C.V.S., was again appointed as Hon. Official Measurer to the show, and judges for the various classes were selected and invitations directed to be sent.

National Pony Stud Book.—It was reported that Volume 22 of the Stud Book would be published at the end of the year. A good entry consisting of 150 stallions, 416 mares and 61 geldings had been received, but the Secretary would be glad to receive additional entries as soon as possible so as to ensure that this volume contained a record entry. Thirty-nine young ponies had been entered for the 1936 supplement, and 14 for the Young Stock Register.

Medal Awards.—During the year, the Society had awarded six gold medals, 14 silver and seven bronze medals, with £10 in prizes for polo

ponies, while eight silver medals and £5 in prizes had been offered for mountain and moorland ponies.

Mountain and Moorland Pony Grants.—A report was submitted showing the results obtained from the grants for the encouragement of mountain and moorland pony breeding, received through the War Office and the Racecourse Betting Control Board. This report indicated that the three Dales pony stallions receiving premiums of £40 each had served 120 mares in 1935, and that 56 foals had been born this year. The five Fell stallions receiving premiums of £32 each had served 172 mares in 1935, producing 79 foals this year. The five Fell stallions had served 194 mares during the season this year. The Pembroke roadster stallion travelling in 1935 had served 69 mares, resulting in 24 foals to-date.

In respect of the other breeds, receiving small grants this year, four Exmoor stallions had received premiums of £10 each, with a super-premium of £5 to the best stallion. Two special prizes of £5 had been awarded to Highland stallions and colts, and premiums would next year be given to colt foals in the spring. £45 had been expended in the offer of premiums for stallions and colt foals at the Lyndhurst and Burley Shows, and in the maintenance of a selected New Forest stallion to serve selected mares. Nine premiums had been awarded to Welsh mountain pony stallions, and prizes had been given to Dartmoor pony colts and stallions, and brood mares.

The Council felt that these various schemes for the encouragement of the various mountain and moorland ponies would have very beneficial results in the near future, and they proposed in due course to have fuller reports on the method in which the grants had been expended.

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GROOMS ACCOMPANYING HORSES BY RAIL

The National Horse Association announces that, following representations to the railway companies, the following concession has been secured: A groom accompanying a horse and travelling in a horse box compartment will be conveyed at half the ordinary single fare for a single journey or ordinary single fare for a return journey, as the case may be. The concession will apply on the basis of one man for each horse. In the case of consignments of ponies under twelve hands high, two ponies will be reckoned as equivalent to one horse. This new arrangement will operate on and from November 1st, 1936, and it is understood that the reduced fare concession will only apply where the groom travels for the throughout journey in the horse box.

The National Horse Association has also been making representations regarding the accommodation provided for grooms in railway horse boxes and is informed that this matter is receiving the attention of railway companies. The Association has for some time held the view that such accommodation could be considerably improved and that the antiquated form of lighting by oil lamps should be abolished in favour of electricity.

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Statistics collected by the Metropolitan Drinking Fountain and Cattle Trough Association show that the total numbers of horses drinking from 67 of the troughs in the Metropolitan Area, in one day (June to August) between 9 a.m. and 5 p.m. (seven hours) were as follows: Year 1931, 14,966; 1932, 13.358; 1933, 14,183; 1934, 14,437; 1935, 14,182; 1936, 13,663.

Erratum.—In the concluding paragraph of Mr. J. F. Timoney's remarks on Professor Kearney's paper on "Veterinary Research in the Irish Free State" published in the *Veterinary Record* on October 3rd, 1936, page 1128, line 28, *read* ". . . liver fluke disease discovered by Norris and Montgomerie."

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REFLECTIONS ON THE MEDICAL CURRICULUM

"Reflections on the Curriculum" was the subject of a leading article in the issue of the *Lancet* of August 29th, and since medical and veterinary education present parallel problems to an extent which is becoming increasingly recognised, we reproduce the article with but slight abridgement.

. . . . .

It is only comparatively recently that the position of the medical education of the country as a whole was closely inspected by the General Medical Council, the one authority on the matter, in response to many reflections, comments, and criticisms, when it became obvious that the general system needed inquiry and that such inquiry would point to the introduction of reforms. The rapid development of scientific medicine proper had been coincident with similar developments in other sciences closely or widely allied with medicine; many of these developments were seen to be in intimate association with medicine and each in its own way advanced with rapidity. Hence it became urgent to consider what demands should be made upon the medical student—how far should a compulsory curriculum take note of this multifarious growth of knowledge? Accordingly there came many proposals and schemes from experienced teachers for ensuring that a course of study should be devised enabling the registered medical man to discharge adequately, upon qualification, his responsibilities towards the public. But for the most part the indications given for reform pointed to gaps in the curriculum—nearly all contributors to the debate found more instruction to be needed in this or that subject, naturally in the subject where they themselves were actually interested. It was seen that the adoption of this diversity of suggestions would make it impossible for the student to find the time and opportunities to acquire the knowledge needed to meet examinational tests in a training of reasonable length. The reports of the proceedings of the General Medical Council, and of the meetings of representatives of the British Medical Association, as well as the columns of the medical press, have brought home to everyone the difficulty of the position.

Duration and Scheme of Training

A curriculum must be definite if satisfaction of its demands is to be met by the granting of a definite legal position. Such a position is obtained for the medical student by registration, and registration is the redemption of an implied pledge to the public on the part of the State that a practitioner is capable of meeting the public needs. If medicine itself were capable of definition a logical curriculum might be devised; but it is not. It is an evergrowing and ever-changing science, intimately related to other sciences, similarly ever-developing. Hence the exact boundaries which a curriculum should have must always be the subject of differences, sometimes fundamental, of opinion.

But there is one place where agreement of view should be assured—for practical reasons the time to be occupied by the training of the student must be arrived at and the syllabuses

of all the accredited schools must be planned with this in view. Here is one place where a consensus of opinion is possible, although to arrive at such a censensus with regard to the details of that training is not obtainable. It is not obtainable now, and it never will be while medicine progresses—a situation which, however embarrassing for educational authorities, must not be regretted. For the existence of reasonable doubt as to what, in any field of knowledge, are the things that count most, forms a proof of the active development of knowledge in that field.

The minimum time in this country for the curriculum is now five years, and it has been generally accepted that the term should not be lengthened. It is well known that the average duration of time spent by the student in his studies from first to last is considerably greater before he reaches the goal of registration—and this under the existing syllabuses with the present range of demand. To meet the many-sided claims for additions to the subjects which have to be mastered, the duration of the curriculum would have to be lengthened, and this is a thing which has been turned down in all the important conferences and deliberations of the last two years. No bodies of high standing and authority have offered any approval for lengthening the time of the curriculum; all have looked to a more orderly arrangement of subjects, and to the reduction in their presentation of an unnecessary or unpractical storage of facts, as the right way to secure sound training without unduly burdening the student. All allow that the student can acquire in five or even six years only a familiarity with the groundwork of the professional subjects proper and with certain selected material from the sciences allied to medicine. The student has to satisfy the test of examinations directed to ensure that he is equipped to meet public needs. He has to be a doctor in the general and ordinary sense of the word, however special or extraordinary his pursuits may later be. His acquaintance with the preliminary subjects must be fundamentally sound, so that the relations of pure chemistry, physics, and biology, to pathology and surgical procedure, may be comprehended. But having regard to the demands upon his time made by work in the wards, he should be exempt, in any definite curriculum, from a knowledge of minutiae which will have no relation to his professional equipment. It is true that all knowledge is advantageous, but the greatest help that can be given to the student is a faculty to use his judgment for the acquisition of wisdom. Thus endowed he will be in possession of prime assistance along any course that is determined by examinational tests, while he will have ability to expand his knowledge by observation, and will have guidance in deciding on one or other of the paths open to him, choosing that which he considers he can follow with most satisfaction.

Scope of Necessary Instruction

A scheme of medical education demands response to these main questions: What is the range of knowledge of the allied sciences, chemistry, physics, and biology, which ought to be acquired before the clinical subjects are reached? How far can these ancillary studies be continued during the clinical course, as their application becomes important in direct relation to the progress of scientific medicine? What range of clinical knowledge should be demanded before registration, so as to ensure the production of well-trained and efficient practitioners, able to deal with the usual problems of practice, and able also to learn from subsequent experience?

Towards the answer to these questions much valuable attention has been directed recently in authoritative reports. The General Medical Council has adopted certain recommendations, meeting the expressed opinions of many educational centres that the absence of due continuity and sequence in medical study has caused the results of examinations to give an unfair view of the work of the candidates. A committee on medical education appointed by the British Medical Association has reported along the whole line, considering the premedical studies, the arrangement of the curriculum, and the nature of the examinations, and lastly the question of post-graduate studies. Thirdly, the Universities of Oxford, Cambridge, and London, in co-operation with the English Royal Colleges and the London Society of Apothecaries, have considered in conference and with much deliberation the existing educational scheme and its influence for well or ill on the student. The result of these combined inspections has been in the first place an agreement that the existing medical curriculum is generally well shaped and of the right duration. The last body stated in their report that the object of the curriculum should be to educate the student so that he could enter practice with some confidence and with a legitimate hope that his scientific outlook on health and disease would enable him to learn from subsequent observations and experience—thus briefly and explicitly setting out the objects of a curriculum devised to meet the State demands. This report stressed the fact that the general education of the intending medical student is of the highest importance, and the members of the conference took first-hand evidence to the effect that the education of the advanced schoolboy need not be neglected during the preparation for preliminary science examinations. But they came to the conclusion that, in order to allow sufficient time for general education and to avoid the danger of too early specialisation, medical studies proper should not be begun before the age of 18. That is to say, that while the secondary schools can with every benefit to the intending medical student take over his instruction in the ground-work of general science, the teaching should be confined to chemistry, physics, and biology (if facilities are available) and should not include anatomy and physiology, where the medical schools will enter the field. If a general consensus of opinion were arrived at that 18 was the earliest age at which medical studies could be begun, we should have a second fixed point for a logical scheme.

Preliminary Studies: Examinations

It is not long since the student on entering the medical school obtained during the first year of his studies as much instruction as was considered necessary for him in the preliminary subjects. But an advance from this position has occurred and to-day premedical education is largely left to the secondary schools, it being found possible and indeed valuable that the necessary instruction should be given coincident with general teaching. The secondary schools have responded well to the demand upon them in the subjects of chemistry and physics, but have been unable so far in any general way to provide due instruction in biology, which preliminary subject remains to be dealt with as part of medical education proper. It may be that this small anomaly will disappear, but it may be also that it is quite well that instruction

in biology should remain in the hands of those who later will provide instruction in anatomy and physiology.

But whether the introduction of the preliminary medical studies into the ordinary course of general education has in any way impeded general instruction or whether it has not, there is no doubt that too many medical students to-day are entering on professional studies proper with an unsatisfactory back-ground. And this is largely responsible for the ever-recurring criticism of the examinational system. Many, probably the greater, number of failures in examinations are due to the low standard of premedical education. The reference is not to training in the ancillary subjects but to general training, and undoubtedly a great deal of trouble and expense would be spared to all concerned if the students as a whole were better grounded. Secondary general education is aimed at enabling its disciple to enter any calling, professional or business, when he or she will be confronted with the special examinations instituted and under the charge of the calling adopted, and it seems that the medical profession does not guard its portals of entrance sufficiently strictly. Too few medical students enjoy the advantages of any real general culture before entrance, and they find considerable difficulty in acquiring the knowledge of anatomy, physiology, and biology demanded from them in the first stage of their professional training; they do not know how to learn and consequently the tackling of an unfamiliar subject bewilders them. Each new course seems more troublesome than the last and failures depress them unduly, for they are unable to see why they fail and are therefore unable to prevent further set-backs. This subject is a perennial one for debate, and recently discussions have been frequent and free. But in spite of the many severe things said of the examination system no one has been able to devise any substitute for examinations where it is necessary to maintain a course of studies up to a definite standard. To this extent examinations are unfair in the medical profession as in any other learned calling—namely, that some of those who fail to satisfy the examiners with ease are as fitted as, or more fitted than, others who pass tests with facility. It is frequent to point to the high percentage of failures as a proof of the strain upon students, and indeed examination neurosis has found its way tentatively into medical literature as a clinical entity. And there may be a certain number of students whose failures can be attributed through no fault of their own to their temperamental make-up, but account is not taken of the now recognised habit of "having a shot at it"; that is to say, many candidates in earlier and later stages of the curriculum sit for examinations being well aware that they are not sufficiently grounded, but trusting, as the range of questions whether for written or verbal reply must be limited, that there will be a chance of success. The nervous temperament is often quoted, the gambling spirit is seldom alluded to, but the latter is accountable for a number of failures. If it could be assumed that the bulk of the medical students arriving for their medical training proper were better adapted to learn, many of the difficulties associated with their training would be simplified and the more or less general approval of the existing curriculum in principle would be further justified.

(To be continued.)

The Editor acknowledges, with thanks, the receipt of the following:—

Communications from Mr. F. D. Armitage (Hadwall, Salop), Professor T. G. Browne (Dublin), Mr. G. O. Davies (Liverpool), Mr. R. E. Glover (Cambridge), Professor W. C. Miller (London), Major D. S. Rabagliati (Wakefield), Captain J. Smith (Kenley).

Reports of meetings of the Lincolnshire and District and the Southern Counties Divisions, N.V.M.A., from Captain W. Gibson and Mr. H. S. Caldwell, respective Hon. Secretaries.

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 30th Sept., 1936	9	9	—	—	2	2	—	64	43
Corresponding period in									
1935	11	14	6	512	2	2	6	101	60
1934	12	13	2	79	1	2	18	63	21
1933	15	16	—	—	3	4	5	21	8
Total 1st January to 30th September, 1936	338	398	5	448	93	235	167	1,460	1,026
Corresponding period in									
1935	261	307	40	10,720	86	172	269	1,478	874
1934	286	325	9	663	103	171	453	1,203	736
1933	217	246	65	6,123	115	192	280	1,070	650

NOTE.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.